

POPULAR SCIENCE

JULY • 35¢ Monthly

Valuable Booklet Inside This Issue:
**What to Do If You
Have an
Auto Accident**



New
U.S. Missile
Fired from
Bomber

"I cleaned and waxed our car in 67 minutes



with Du Pont's NEW CAR WAX



...it still looks great 6 months later!"

says Robert MacMoran of Glenview, Ill., after waxing his '55 Chevrolet with Du Pont New Car Wax. Bob found that this new paste wax is as easy to use as liquid polish, because it cleans, waxes and glazes—all in *one easy application*. And it protects with real Carnauba wax, the toughest wax known. Proof of protection is the long-lasting gleam. Six months, nine car washings later, the finish shows clear reflections of Bob and his son. Try Du Pont New Car Wax—it makes any good finish look new. At service stations and auto supply stores. Only \$2.00.



BETTER THINGS FOR BETTER LIVING...THROUGH CHEMISTRY

5-RECORD GLENN MILLER ALBUM FREE

with the first album you buy as a new member of the NEW

RCA VICTOR POPULAR ALBUM CLUB

... if you agree to buy five additional albums from the Club
in the next year from at least 100 albums to be made available

This exciting new plan, under the direction of the Book-of-the-Month Club, enables you to have on tap a variety of popular music for family fun and happier parties. Moreover, once and for all, it takes bewilderment out of building such a well-balanced collection.

You pay far less for albums this way than if you buy them haphazardly. For example, the extraordinary introductory offer described above can represent around a 40% saving in your first year of membership.

Thereafter you save almost 33 1/3%. After buying the six albums called for in this offer, you will receive a free 12-inch 33 1/3 R.P.M. album, with a retail price of at least \$3.98, for every two albums purchased from the Club.

A wide choice of RCA VICTOR albums—enough to satisfy every kind of taste—will be described each month. One will be singled out as the album-of-the-month. If you want it, you do nothing—it will come to you automatically. If you prefer one of the many alternates—or nothing at all in any month—you can make your wishes known on a simple form always provided. You pay the nationally advertised price—usually \$3.98, at times \$4.98 (plus a small charge for postage and handling).



AN ALBUM OF FIVE 12-INCH 33 1/3 R.P.M. RECORDS
CONTAINING SEVENTY-FIVE DIFFERENT SELECTIONS



These recordings represent the high point as well as the final chapter in Miller's legendary career. Here are 75 selections played by the 50-man, star-studded Air Force Band, including definitive versions of Miller's biggest hits—*In the Mood*, *Tuxedo Junction*, *St. Louis Blues* March, etc. The sound of the original wartime recordings has been enhanced via RCA VICTOR's "New Orthophonic" techniques in order to recapture the glamour and excitement his band once radiated.

BEGIN YOUR MEMBERSHIP WITH ANY OF THESE ALBUMS: WRITE TITLE IN COUPON

WE GET LETTERS	Perry Como	MUSIC FOR DINING	Metachord Strings
DELAFFONTE	Harry Belafonte	BOUQUET OF BLUES	Elton Britt
FRANKIE CARLE'S SWEETHEARTS		SWEET 17	Ames Brothers
BRASS & PERCUSSION	Morton Gould	HEART OF HAVANA	Orquesta Aragón
JAMAICA	Long Horse	EYES OF LOVE	Hugo Winterhalter
STUDENT PRINCE	Mario Lanza	MOONLOW	Artie Shaw
BING WITH A BEAT	Bing Crosby	MARJORIE MORNINGSTAR	Original Film Sound Track
TOWN HALL CONCERT PLUS	Louis Armstrong	IN A MELLOTON	Duke Ellington
LET'S DANCE with the Three Stooges		VICTORY AT SEA	N.B.C. Symphony Orchestra
SHORTY ROGERS PLAYS RICHARD RODGERS		POUR IT AND BESS	Ella Stevens—Robert Merrill
THE FAMILY ALL TOGETHER	Buddy Holly		
THINKING OF YOU	Eddie Fisher		

THE RCA VICTOR POPULAR ALBUM CLUB

P03-7

c/o Book-of-the-Month Club Inc., 345 Hudson Street, New York 14, N.Y.
Please register me as a member of The RCA Victor Popular Album Club
and send me, from, the five-record album, *Glenn Miller's Army Air Force
Band*, with the first Club album I purchase, indicated below. I agree to buy
five other albums offered by the Club within the next twelve months, for
each of which I will be billed at the nationally advertised price: \$3.98 (at
times \$4.98), plus a small charge for postage and handling. Thereafter, I
need buy only four such albums in any twelve-month period to maintain
membership. I may cancel my membership any time after buying six albums
from the Club. After my sixth purchase, if I continue, for every two
albums I buy, I may choose a third album free.

(Please print title of purchase album here)

Name _____

Address _____

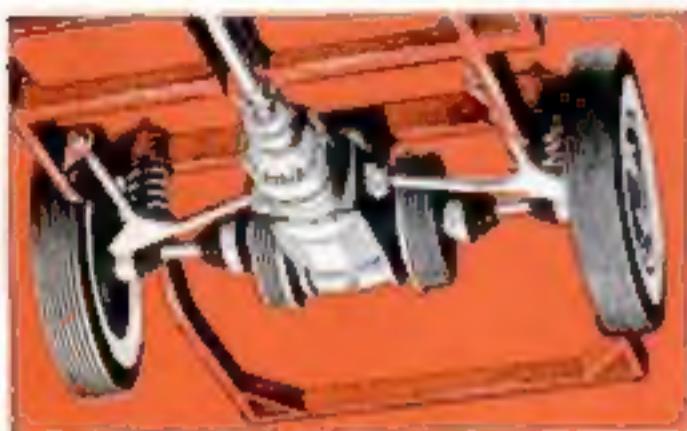
City _____ Zone _____ State _____

PLEASE NOTE! Send no money. A bill will be sent. Albums can be shipped
only to residents of the U.S., its territories and Canada. Albums for Ca-
nadian members are made in Canada and shipped duty-free from Ontario.

Popular Science Monthly

July, 1958

Cover photograph by W. W. Morris



What's Detroit doing about that drive-shaft hump in your car? Here's the inside story of developments that may flatten your floor—and revolutionize the U. S. automobile.



Is this the grin of a man-eater? Meet Oxynotus—and some other members of the shark family.

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Here's everything you should know
about the new fans. Plus specs.*

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*Clean-up tips and pictures show
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Publisher

RALPH H. FLYNN

Advertising Manager

LEE P. ADAMS

Circulation Director

EUGENE WATSON

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PS Readers

TALK BACK

Questions and Answers

ASK yourself what answer the tester wants, then give it to him, you advise job hunters ["How to Boost Your Score on Any Test," May]. Last June my nephew actually tried this.

An employment agency gave him a "personality test" for a job as clerk in a big insurance firm. Then two days later



someone else at the agency handed him the same test to see if he could run a local branch of a travel bureau.

Three of the questions went something like this:

1. Do you feel most at ease when (a) following a good leader or (b) leading others?

2. In which of these two groups does a hobby appeal to you most? (a) Seeing good movies and plays; reading; swimming; or (b) working in an amateur theatrical group; dancing; boat-racing.

3. If a supervisor gave instructions that you suspected would not work, would you (a) tell him so and propose another way, or (b) bear in mind his longer experience and give his way a try?

The boy answered the office-clerk application with 1-a, 2-a, 3-b. For the job of managing the travel office, he reversed himself: 1-b, 2-b, 3-a.

That's right—he got interviewed by both employers. As it turned out, he didn't take either job—meanwhile word came that he had won a scholarship to law school.

J. A. JOHNSON, Chicago.

Astrophysicist Praises PS Article

ALDEN P. ARMAGNAC'S article, "What We're Learning from the Satellites" [May], is very deftly put together, accurate (so far as our optical competence

can judge), and refreshingly clear. Would that there were more such.

JOHN WHITE

Astrophysical Observatory
Smithsonian Institution
Cambridge, Mass.

Ball Teams Vs. Scientists

IT IS encouraging to know that some Americans are interested in achieving a higher standard of education ["Russian Schools Can Teach Us a Lesson," Mar.]. I believe that Admiral Rickover is on the right track.

Last fall, I left a Canadian high school to continue my studies in Switzerland. There is absolutely no comparison between the two systems in quality of text books, courses, teachers and teaching methods. About 40 percent of the time in my previous school was taken up by extracurricular activities. Now I must catch up on lost academic time.

Large gymnasiums and other facilities serving non-educational functions are



fine, but are schools built to produce a ball team or scientists and leaders?

ARTHUR BRAND, Zurich, Switzerland.

Lost Letter Brings Letters

A SINGLE "m" missing in an April article ["New Radio Steals Its Power from the Air"] has brought us many inquiries. In the parts list, the trimmer condensers are listed as 180 mfd. This, of course, should read 180 mmfd. A published correction might relieve our writer's cramp.

JOHN SMALL

Telepower, Silver Spring, Md.

... I built your telepower receiver and it worked very well. But after some ex-

"HOW A 'CRAZY RUMOR' GOT ME PROMOTED!"



What I overheard one morning shook me right out of a rut!

"Company's getting ready to cut back . . . bound to be layoffs," I heard them say. "Just another crazy rumor," I told myself.

Just the same, I took quick stock of myself that night. Came up with four good reasons why the company would keep me on:

*Three years' experience
Getting along with foreman
Turning out acceptable work
Prompt and dependable*

And four just-as-good reasons why they might let me go:

*Making no real headway
Others better qualified
Still rated "semi-skilled"
Needs special training*

I wasn't in trouble. But I sure wasn't "in solid" like I should be. That's when I made up my mind to enroll for training with I.C.S.

I picked I.C.S. because it's the oldest and largest with 257 courses. The training is quick and thorough. It's recognized by my company and accredited by the National Home Study Council. You study in your spare time and get personalized, practical instruction—know-how you can apply next day on the job.

That was a year ago. There have been two layoffs since then. While some of the others were just hanging on or being released, I was moving up. My I.C.S. training started something. Not only did it get me promoted (with a fat pay hike), but it put me in line for real advancement.

Don't wait for a "crazy rumor" to set you straight. Take out your "job insurance" right now. Mail the coupon and get full, free details on how I.C.S. has helped thousands, how it can help you. No obligation—and you get three valuable books free! (1) How to Succeed; (2) Catalog of opportunities in the field of your choice; (3) Sample lesson (math).

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Without cost or obligation, send me "How to SUCCEED" and the opportunity booklet about the field BEFORE which I have marked X (give sample lesson):

ARCHITECTURE and BUILDING CONSTRUCTION

- Air Conditioning
- Architecture
- Arch. Drawing and Designing
- Building Contractor
- Building Estimator
- Carpentry and Millwork
- Carpenter Foreman
- Heating
- Interior Decoration
- Painting Contractor
- Plumbing
- Reading Arch. Blueprints

ART

- Commercial Art
- Magazine & Book Illus.
- Show Card and Sign Lettering
- Sketching and Painting

AUTOMOTIVE

- Automobiles
- Auto Body Rebuilding and Refinishing
- Auto Engine Tuneup
- Auto Technician

AVIATION

- Aero-Engineering Technologist
- Aircraft & Engine Mechanic

BUSINESS

- Accounting
- Advertising
- Business Administration
- Business Management
- Cost Accounting
- Creative Salesmanship
- Managing a Small Business
- Professional Secretary
- Public Accounting
- Purchasing Agent
- Salesmanship
- Salesmanship and Management
- Traffic Management

CHEMICAL

- Analytical Chemistry
- Chemical Engineering
- Chem. Lab. Technician
- Elements of Nuclear Energy
- General Chemistry
- Natural Gas Prod. and Trans.
- Petroleum Prod. and Engr.
- Professional Engineer (Chem.)
- Pulp and Paper Making

CIVIL ENGINEERING

- Civil Engineering
- Construction Engineering
- Highway Engineering
- Professional Engineer (Civil)
- Reading Struc. Blueprints
- Structural Engineering
- Surveying and Mapping

DRAFTING

- Aircraft Drafting
- Architectural Drafting
- Drafting Machine Design
- Electrical Drafting
- Mechanical Drafting
- Sheet Metal Drafting
- Structural Drafting

ELECTRICAL

- Electrical Engineering
- Elec. Engr. Techniques
- Elec. Light and Power
- Practical Electricity
- Practical Lineman
- Professional Engineer (Elec.)

HIGH SCHOOL

- High School Diploma

(Partial list of 257 courses)

Before which I have marked X (give sample lesson):

QUAD ENGLISH

- High School Mathematics

SHORT STORY WRITING

- Industrial Foremanship

INDUSTRIAL SUPERVISION

- Personnel-Labor Relations

SUPERVISION

- Supervision

LEADERSHIP

- Industrial Foremanship

INDUSTRIAL SUPERVISION

- Personnel-Labor Relations

INDUSTRIAL SAFETY

- Safety Practice

INDUSTRIAL INSTRUMENTATION

- Industrial Metallurgy

INDUSTRIAL METALLURGY

- Industrial Safety

INDUSTRIAL DESIGN

- Machine Shop Practice

INDUSTRIAL ENGINEERING

- Mechanical Engineering

PROFESSIONAL ENGINEER (MECH.)

- Quality Control

READING STRUC. BLUEPRINTS

- Reading Struc. Blueprints

STRUCTURAL ENGINEERING

- Reinforcement and

AIR CONDITIONING

- Air Conditioning

TOOL DESIGN

- Tool Design

TEST MARKING

- Test Marking

GENERAL ELECTRONICS TECH.

INDUSTRIAL ELECTRONICS

- Practical Radio-TV Eng'g

PRACTICAL TELEPHONY

- Radio-TV Servicing

RAILROAD

- Car Inspector and Air Brake

DIESEL ELECTRICIAN

- Diesel Eng'r. and Firemen

DIESEL LOCOMOTIVE

- Diesel Locomotive

STEAM AND DIESEL POWER

- Combustion Engineering

POWER PLANT ENGINEER

- Stationary Diesel Eng'r.

STATIONARY FIREMAN

- Stationary Fireman

TEXTILE

- Carding and Spinning

COTTON MANUFACTURE

- Cotton Winding and Weaving

WOOL MANUFACTURE

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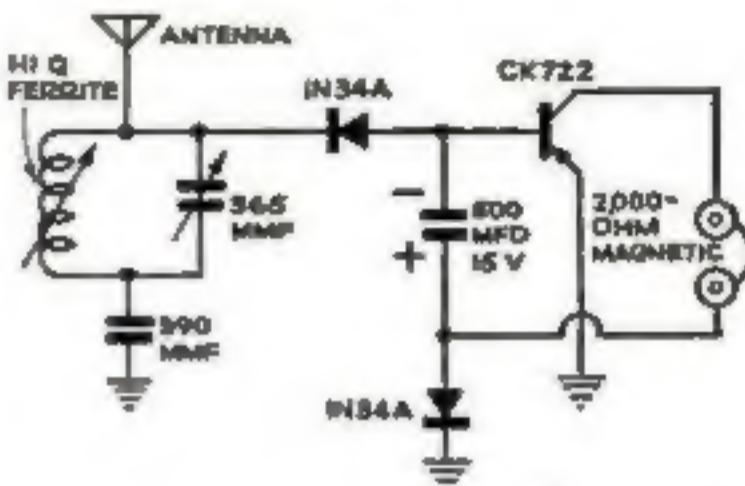
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PREFER
PROTO
PROFESSIONAL
TOOLS

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2209 Santa Fe Ave.
Los Angeles 54, Calif.

perimenting, I think I have come up with a circuit that works equally well and is less expensive to build. As shown on the



schematic, I used a Ck 722 instead of the Ck 721 transistor you specified.

E. F. SCHMIDT, Springfield, Mo.

Here's a field that's wide open for kitchen-table experimenters. Have any other readers done anything interesting with telepower?

Small-Car Owners Speak Up

IN YOUR report on the "8 Best-Selling Small Cars" [Apr.], you say that the Renault Dauphine averages 28.2 m.p.g. in stop-and-go traffic; 30 m.p.g. on the parkways at a steady 50 m.p.h. I am the proud owner of a 1957 Dauphine and find it impossible to get less than 32 m.p.g. in city traffic, 38 on the road.

ALAN CHAIKIN, W. Hempstead, N.Y.

. . . An owner of a Renault Dauphine, I take exception to your gas-mileage report. I note that the Volkswagen specs indicate a higher gas mileage. I checked these with a VW owner, and we are of the opinion that the two might have been accidentally interchanged.

Your other findings compare pretty well with our own. I, too, wish the Dauphine had a little more "poop" in the engine department. But I wouldn't trade mine for an oversize Detroit barge with horsepower I don't need.

G. R. SCHNEIDERMAN, Los Angeles.

Our gasoline-mileage tests on the Volkswagen and Dauphine were run twice and averaged out. Results were substantially the same on each test. However, a difference in tune of the two cars could have affected our gas-mileage comparisons.

Heart Throbs Cure Head Throbs

I'D LIKE to point out that many attacks of migraine are much more severe

Satisfied with my PRESENT PAYCHECK? **NOT ME!!**

TODAY, you are probably earning enough to get by—enough to provide your family with life's necessities, and perhaps you are depositing a few extra dollars in the bank.

BUT are you content with just earning a living wage? Do you say "Someday I'll really get a break and go right on to the top." THAT'S WISHFUL THINKING!

You know that the "breaks" go to the man or woman who is prepared to take advantage of them—to the person who can fill the better job and who is worth more money. He makes the "breaks" instead of waiting for them.

DO YOU QUESTION YOUR OWN ABILITY?

There is a field of business which has never been overcrowded—it's the ACCOUNTING FIELD. And the demand for skilled accountants—men and women who really know their business—is increasing. State and Federal legislation requires much more efficient accounting from business. Corporations are in constant need of expert counsel in matters relating to Auditing, Cost Accounting, Business Law, and Federal Income Tax. Men who prove their qualifications in this important branch of business are promoted to responsible executive positions—given an opportunity to earn real salaries. The range is \$5,000 to \$10,000 a year—even to higher income figures.

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JULY 1958]



than described in your February issue ("What Science Knows About Headaches").

One case I know of had periods of visual blackouts, numbness of hands, loss of speech for an hour at a time, all of which symptoms were not repeated for weeks or months—then hit again.

Several medical men have told me—a victim for many years—that migraine appears to follow interruptions of work schedules and personal relationships, and is sometimes more like a mild form of epilepsy than a mere headache. It often stops after a hearty meal. Another doctor told me that people in love seldom have migraine attacks.

E. T. NESBITT, Quebec, Can.

Gun for Hire?

I've tried curing my dog of chasing cars. So your tips in "What Science Has Done for Your Dog" [May] caught my eye.

You say drive by in a friend's car, and use one of three punitive measures as Fido comes running out to bark and chase. *Jump out and switch him.* I doubt if I could get out of a tight-fitting modern car

fast enough to stop Fido's usually fast retreat. *Throw water on him.* I shy from such exhibitionism as this. *Toss a firecracker at him.* In my state you can't use firecrackers without a license.

I've found a simpler cure. Buy a kid's water pistol. Fill it with diluted house-



hold ammonia. Fire a few squirts in Fido's direction from the moving car. Dogs can't stand the scent of ammonia.

CHARLES GRANT, Larchmont, N.Y.

Short Cut Please Pro

KEN MURRAY's idea of using a little felt washer at the bottom of the knockout punch die, or chassis punch ["Short Cuts and Tips," Mar.] to lubricate the screw is a clever one. This should definitely, at all times, keep the screw lubricated for longer wear.

We'd like to use this little hint ourselves, if you don't mind.

GREENLEE TOOL Co., Rockford, Ill.



Petroleum engineer with a tough hair problem. John Doles spends his days on an oil rig off Louisiana's Gulf Coast. He's outdoors a lot, and sun and wind punish his hair.



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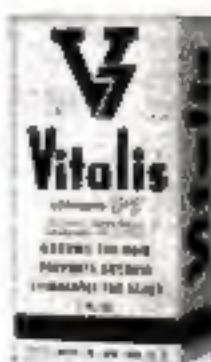
New greaseless way to keep your hair neat all day...and prevent dryness

If you like your oil in wells and not on your hair, you'll like Vitalis. It keeps hair in condition... prevents dryness.

Your hair never has a greasy look because Vitalis grooms with greaseless V-7. Use Vitalis every morning.

New VITALIS® Hair Tonic with V-7®

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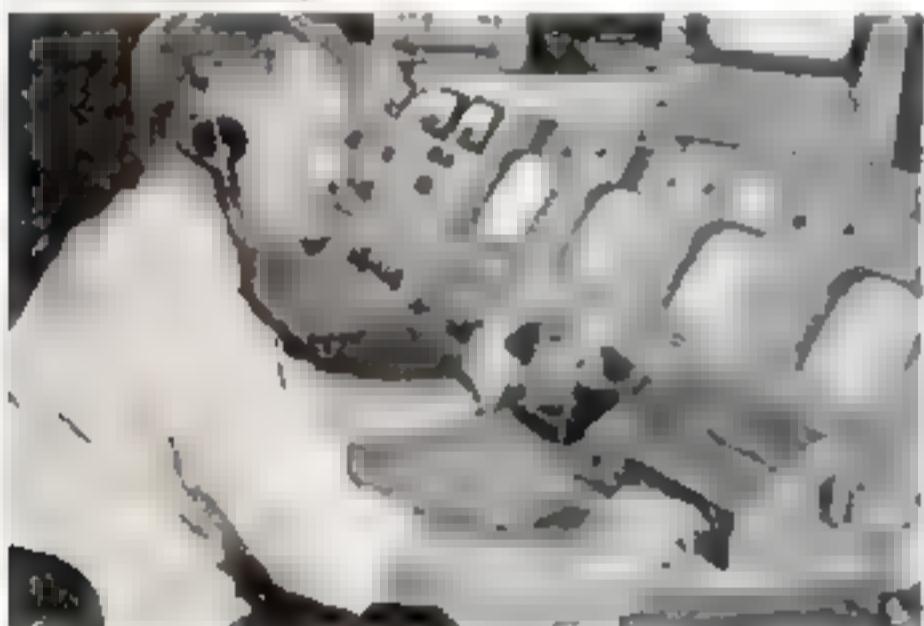


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A. E. Smith
Founder

Find Out What Radio-TV Offers You

As trained Radio-TV Technician you are prepared to supply much needed services. The technician is a respected and appreciated member of his community. Get Sample Lesson FREE. See how practical NRI has made learning at home. Mail the coupon. You also get 64-page Catalog telling about NRI, the lessons, equipment supplied, instruction services.

N.R.I. TRAINED THESE MEN FOR SUCCESS



"I am a police captain and have a good radio. I now build it there also service business. Just open new shop." C. W. LEWIS, Pensacola, Florida.



"Received my license and work at radio station in China. Now own S. S. J. M. A. T. First job to N.R.I. R. D. ARNOLD, Humford, Rhode Island."



"Circled while meat market manager. Got into technical job. In a year my pay increased 50%." C. CARTER, San Bernardino, California.



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The month in science

Hot atoms are cheaper. Expect to meet—in person—the strange products of the atomic age before long. For the first time, you will come across those wonders of the laboratory, radioactive isotopes, in everyday life, doing old jobs better and making possible some entirely new ones.

Reason: AEC has cut isotope prices like a recession-crazed car dealer. One particularly useful isotope, strontium 90, was tagged at \$500 per curie. Now it's \$5. (A curie is a measure of the amount of radioactivity and represents quite a lot.)

It's not that business is slow with the AEC. Oak Ridge, the main plant, grossed \$2,700,000 on isotopes last year, double the 1954 volume. There are just a lot more isotopes to sell.

Radioactive isotopes are the ashes from atomic furnaces. When the uranium fuel splits, it generates hundreds of kinds of hot atoms, most of which can be made no other way. These ashes must be separated to recover the valuable unburnt fuel remaining (the fuel never burns up completely).

Until now, the isotopes have been separated by a small-scale laboratory setup. Hence the high cost. But the number of atomic furnaces operating is increasing rapidly (121 now, 89 being built, 67 planned). That means a lot of ashes to refine, a lot of isotopes.

A new, bigger ash refinery opens this summer. AEC cut isotope prices on the basis of this greater capacity.

What can you do with isotopes—even at low prices? Radioactive materials are unique. They throw off pieces of themselves—energetic rays that are invisible and silent yet easy to detect or manipulate. Some lose this valuable property in minutes, others can continue it for hundreds of thousands of years.

Ingenious ways of exploiting radioactivity already keep 100 firms in business packaging and distributing hot atoms. Present commercial uses, sure to be stimulated by lower prices, include:

- Small, lightweight "X-ray" machines, which use hunks of cesium 137 instead of X-ray tubes. Rays from cesium 137 penetrate solid materials and affect photographic film, just like X rays.
- Luminous signs. Strontium 90 gives off rays that make phosphors glow on instrument dials, road signs, safety markers.
- Thickness gauges. Counting the rays passing through a solid material gives a sensitive measure of its thickness or density. Cigarette factories already use 3,000 of these little gadgets to make sure you get your smokes firm and fully packed.
- Batteries. The rays from isotopes can be turned into electricity in a wire by at least five different methods. Big advantage of these atomic batteries is small size and exceptionally long life; big disadvantage is low power.

That's only the beginning. AEC itself suggests one new use (potentially a very large one):

Put some hot atoms inside fluorescent lamp tubes to eliminate

The month in science

starters and transformers. The isotope rays would keep the gas inside the lamp electrically charged, ready to conduct current and shed light when you turned on the switch.

Airplane fuel, absolutely free. Ready for test flights in maybe a year will be a weird kind of very-high-altitude (70 or 80 miles) airplane that seems fantastically close to a perpetual-motion machine. Its fuel: atoms of air. Its engine: an open-ended pipe coated with everlasting chemicals (no moving parts at all).

The trick is the fuel. Ordinary air at the earth's surface contains oxygen in molecular form, each molecule consisting of two oxygen atoms joined together. Up high, however, ultraviolet rays from the sun break up the oxygen molecules, and the thin air contains single oxygen atoms. If you make the separate atoms combine into two-atom molecules, heat is generated.

The engine is a ramjet flying stovepipe, which scoops air in and heats it so that it goes out the back faster than it came in the front. This propels the plane forward.

The new idea is to get the heat from the combining oxygen atoms. A chemical catalyst coating the inside of the chamber would make the oxygen atoms combine, but would not be affected by the reaction.

Technically, all this is possible. Question: Can you use the free fuel efficiently enough to keep a plane aloft? Answer: Maybe.

Up where oxygen atoms live alone, there aren't very many of them. The most energy you could expect from combining atoms in a cubic foot of 85-mile-high air is around .0001 B.T.U. That's not much. To fly, the plane might have to be 1,000 feet or more long and made out of nothing heavier than Reynoldswrap.

Such a craft isn't as useless as it sounds. Running on air, it could fly continuously. Made of aluminum, it would be a good radar reflector, might serve as a relay mirror for TV networks.

First test flight will be made by a small plane. It cannot take off from the ground, but must be launched like a satellite from the nose of a rocket. It will be collapsible, automatically unfolding to the right shape after it is shot out of the rocket nose.

Death rays in space. U.S. satellites have radioed back discovery of an unforeseen barrier to space exploration—deadly radiation that begins 1,000 miles up. University of Iowa scientists exonerate cosmic rays, suspect the culprit is a stream of fast electrons from the sun. Hitting the satellites' metal, they generate X rays—enough to be dangerous to men after three days' exposure.

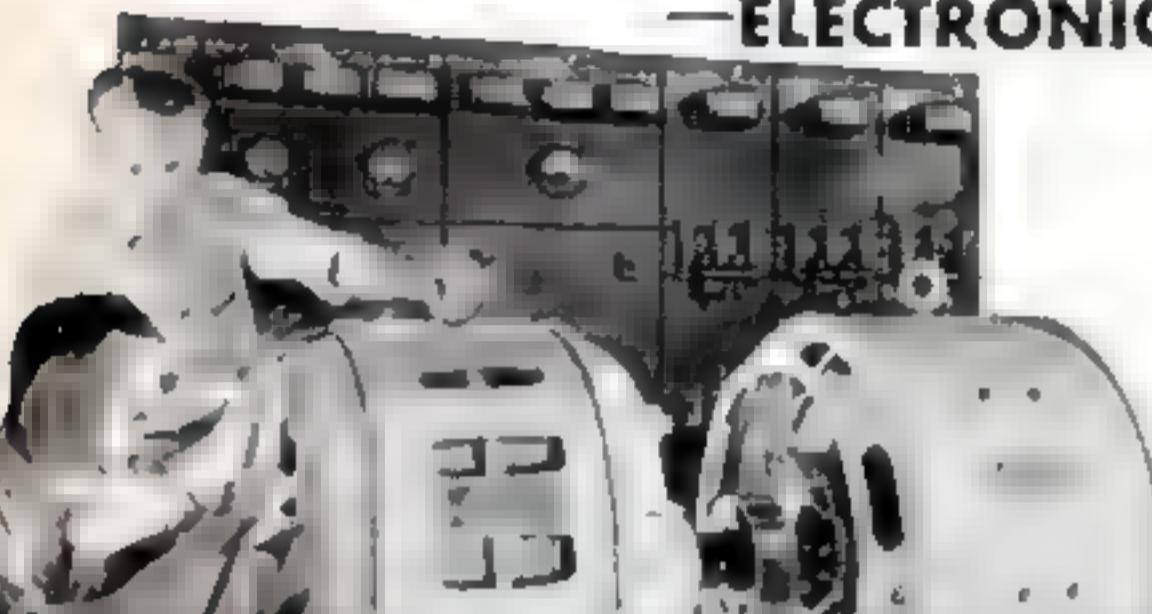
If the radiation barrier is only a narrow band, it won't stop long-range space ships. They could pass through before serious harm was done. But it means that space platforms orbiting in this region will need the extra complication of heavy shielding.

Martin Mann

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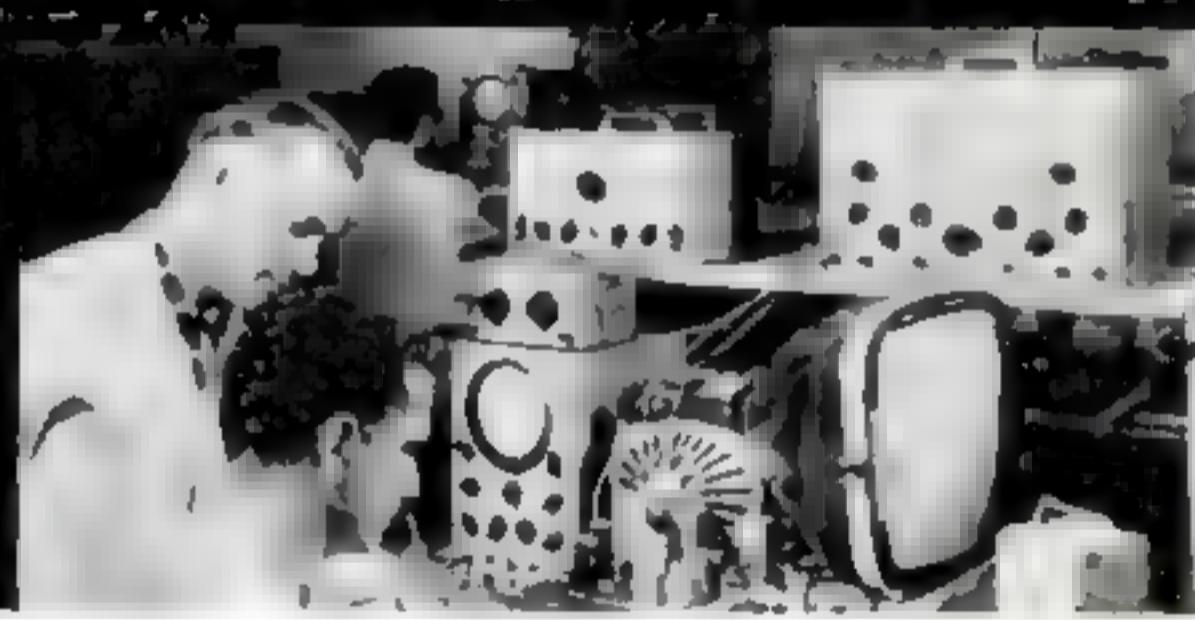
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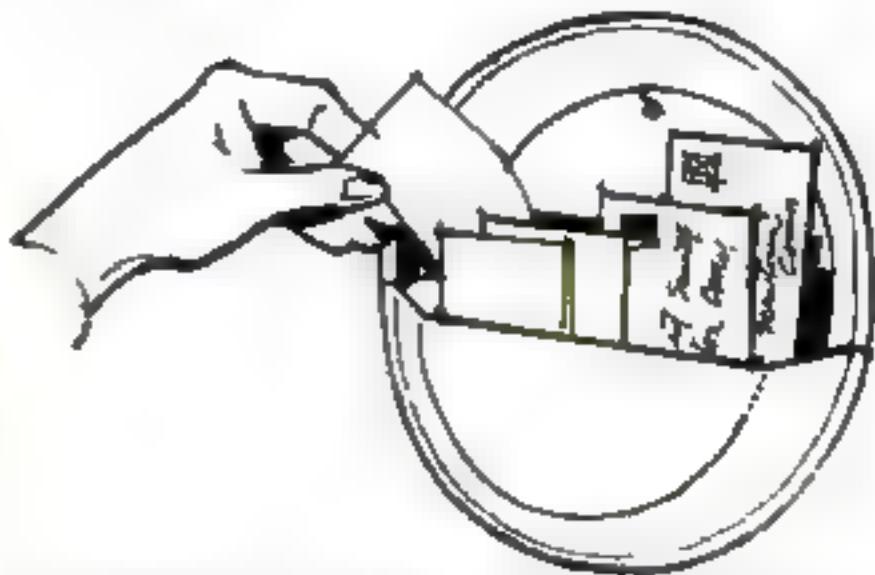
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CITY STATE

Keeping the Home Shipshape



SODA STORAGE IS EASY. Cut holes $3\frac{1}{2}$ " in diameter in a wooden shelf and screw it 4" from the floor of a cabinet or closet so that the floor acts as a base for the bottles.



A KITCHEN WALL RACK FOR LETTERS, bills or memos can be made from two pie tins, one cut in two. Solder one of the halves to the whole tin with rim facing rim to form a pocket.

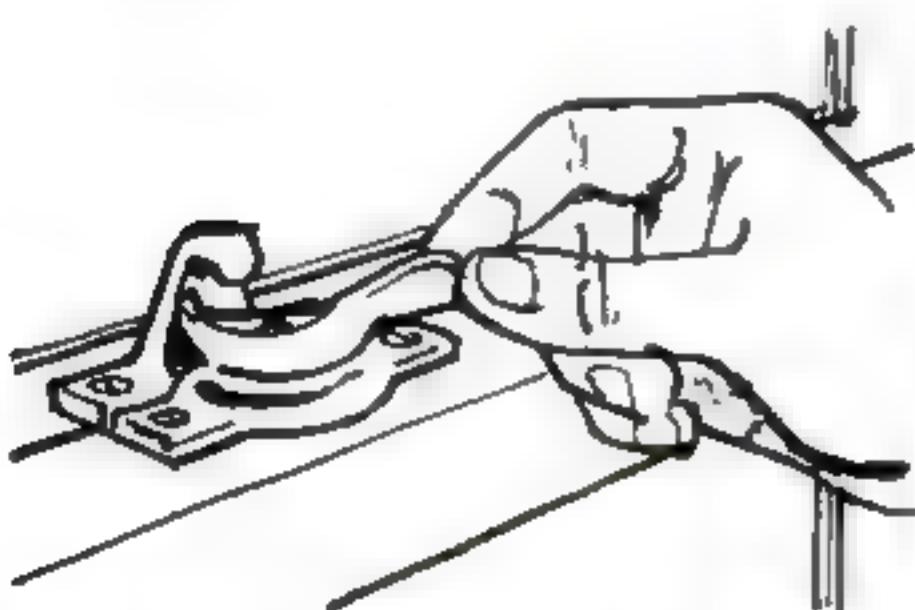


NEED A DINNER BELL on the porch or patio? An empty propane-torch cylinder makes a good

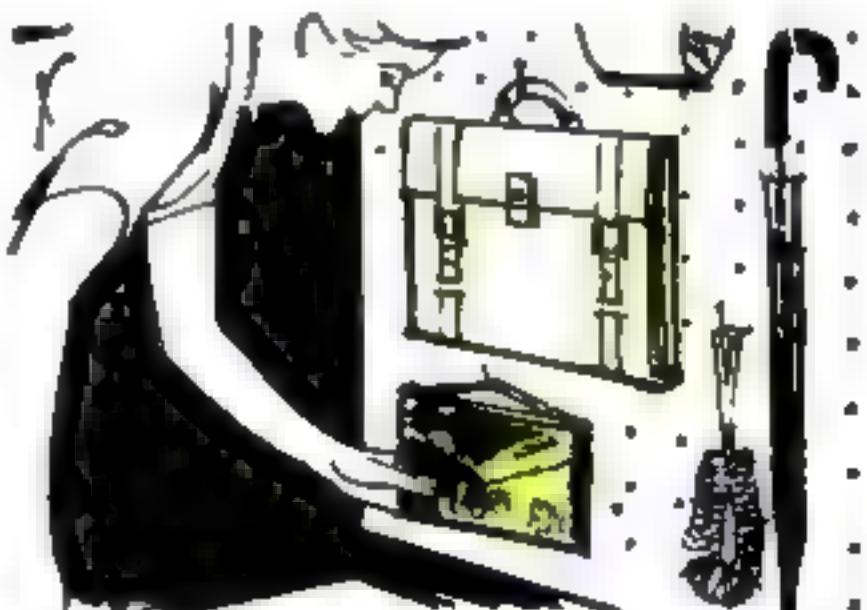
one. When struck with a small hammer or a metal rod it will sound off with a clear ring.



Bartow



HOUSE AIR CONDITIONED? Lock the windows to eliminate cracks that admit hot air. Even where weatherstripping is used, the pressure of the lock gives you a much tighter seal.



HANG UP HANDBAGS, umbrellas, anything with a handle. Fasten a strip of perforated hardboard to a closet wall. Leave $\frac{3}{8}$ " of space behind panel for insertion of metal hangers.

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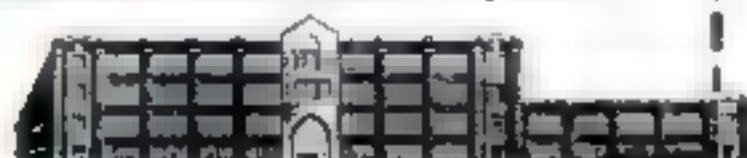
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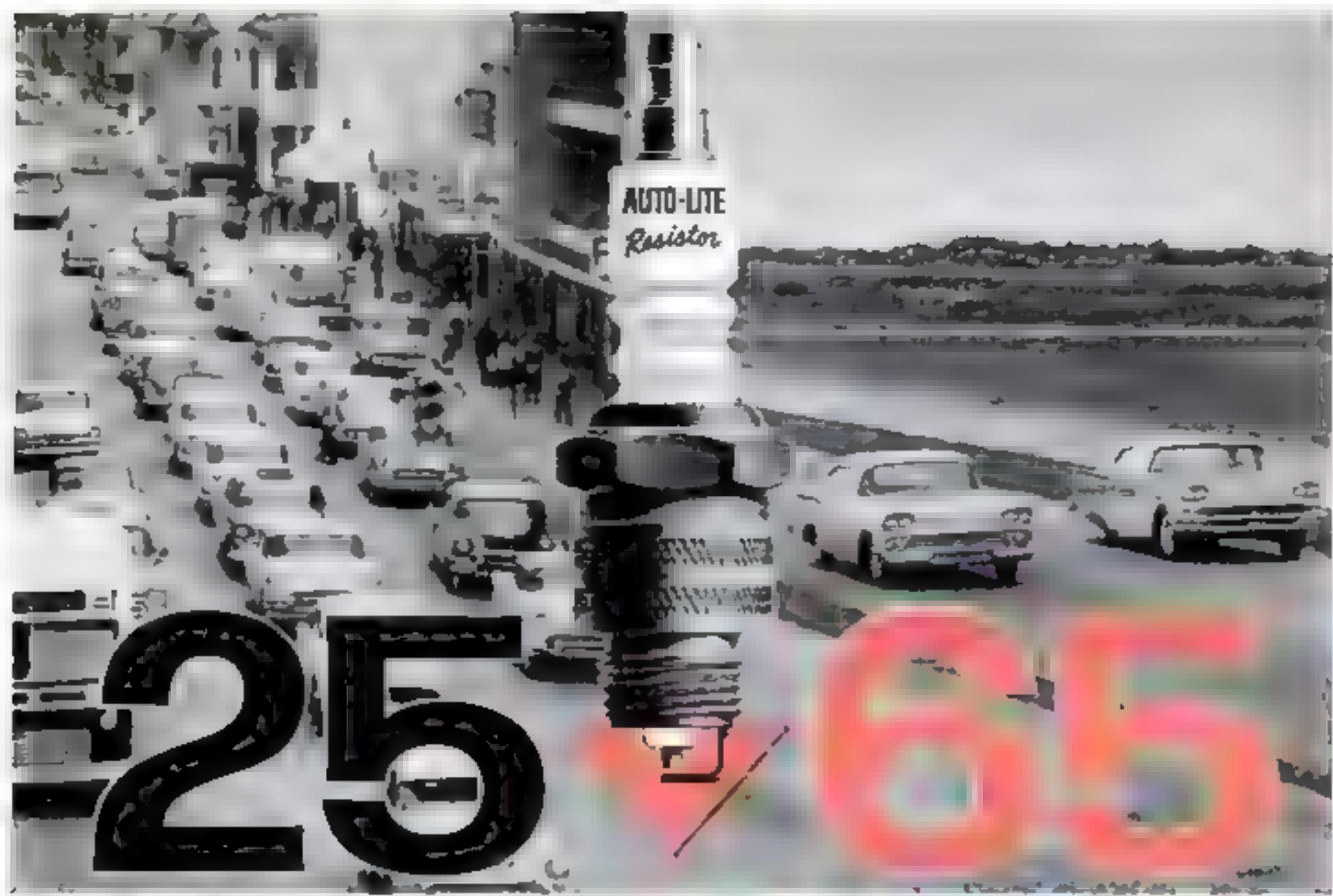
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Auto-Lite Resistor Spark Plugs with **POWER TIP** "Fire Up" your engine* at all speeds!



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Power Tip protrudes farther into the combustion chamber for better ignition. Fuel burns more evenly and completely to give top performance and economy at all speeds.

At low speeds, the projecting Power Tip is in the thick of combustion where it gets hot quicker and stays hot to burn fouling deposits away clean. At higher speeds, the projecting tip is in the path of the incoming air-fuel mixture where it stays cooler to effectively check power-robbing pre-ignition. Ask your garage or service station to install Auto-Lite . . . the only spark plugs with Power Tip . . . and start enjoying top performance and economy from your car at all speeds.

*Power Tip, with or without Resistor, is ignition-engineered for overhead-valve V-8 engines and for most overhead-valve 6-cylinder engines in all these cars—Buick, Cadillac, Chevrolet, Chrysler, De Soto, Dodge, Edsel, Ford, Hudson, Imperial, Lincoln, Mercury, Oldsmobile, Nash, Packard, Plymouth, Pontiac, Rambler, Studebaker.

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Auto-Lite makes a complete line of spark plugs, including Standard, Resistor, Marine, Small-Engines, Transport, and Aircraft.

You ought to know...

Your family car costs more to run these days. You probably knew that all along. But here are some hard figures (see table below) to back it up. These costs were compiled by a Chicago transportation-research firm, and released through the American Automobile Association.

AUTOMOBILE OPERATING COSTS			
VARIABLE COSTS (average per mile)	1956	1957	% Change
Gas & oil	2.42¢	2.39¢	down 1%
Maintenance	.74¢	.79¢	up 7%
Tires	.53¢	.59¢	up 11%
Total	3.69¢	3.77¢	up 2%
ANNUAL FIXED COSTS	1956	1957	% Change
Insurance Fire, theft	\$ 16.48	\$ 21.37	up 29%
Damage, liability (\$25-50,000)	\$ 86.92	\$ 95.35	up 10%
License & registration	\$ 17.60	\$ 19.16	up 9%
Depreciation	\$514.00	\$565.42	up 10%
Total	\$635.00	\$701.30	up 10%

Source: *Roadmaster & Co.*, via American Automobile Assn.

The figures won't apply to your car right down to the last penny. Variables make costs highly individual. Take gas and oil consumption. It depends upon many elusive factors, such as tire pressure, driving habits, accessories. The condition in which you keep your car will influence the rate of depreciation. But you can use the table as a reliable standard for comparison, a good national average. The company based its calculations on low-price, standard-size U.S. cars:

late-model six-cylinder Fords, Chevies and Plymouths.

Yearly costs are easy to figure. Multiply the total of variable costs per mile by your total annual mileage. Add that to the annual fixed costs. As mileage goes up, it becomes more economical. Five thousand miles cost \$890. But for about \$200 more, you can double the driving and go 10,000 miles.

Styling may push prices higher on the 1959 cars. One main reason: advanced designs in windshields and windows. The more style you get, the costlier the research and engineering.

Sneak peeks at the 59s show that glass is getting a bigger play than ever. The wraparound windshield is living up to its name. It's becoming longer and higher, particularly in the Chevrolet, and possibly the other GM lines.

Chevy's wraparound windshield goes well back into the roof panel. Glass on some models runs so far back that the steel roof panel has shrunk to four feet in length, a cut of between two and three feet.

This monumental glassware the stylists are dreaming up will cost you in more ways than one. Shattered by a tire-tossed rock, a futuristic windshield could run up a repair bill as expensive as a minor head-on collision of 10 years back. That in turn will probably mean higher premiums for your collision insurance.

Watch out for confidence men. With dollars harder to come by, frauds of all kinds are mushrooming and luring easy victims.

The Federal Bureau of Investigation says that con men are

You ought to know...

plucking more "pigeons" than ever, and raking in untold millions. The State of New York recently opened a consumer-frauds division in its attorney general's department. Suddenly, the division was swamped with 100 fraud cases a week. Fraud tricks are as old as the Trojan horse. But they still work with ridiculous simplicity. People are falling for these well-worked frauds:

- Home improvements. "I'm in business for myself and can keep my costs down for you," says the typical gyp contractor. He may do only \$2,000 worth of work, but padding doubles the bill.
- The "model-home" gimmick. A more artful form of fraud, it works like this: An alleged contractor offers to reroof your house. He claims he'll show it as a model home to other prospects. And he'll give you \$50 for each showing that pays off in a new job. Actually, you get cheap roofing, and no \$50 dividends.
- Credit-card frauds. If you own or work for a business that deals directly with the public, check credit cards carefully. Con men are getting a lot of mileage and meals on stolen credit cards. And, incidentally, guard your own cards. You won't enjoy getting the bill if someone else has gotten the merchandise.

POPULAR SCIENCE Price Report

REFRIGERATOR (10-11½ CU. FT.)



\$220

TV SET (21-INCH)



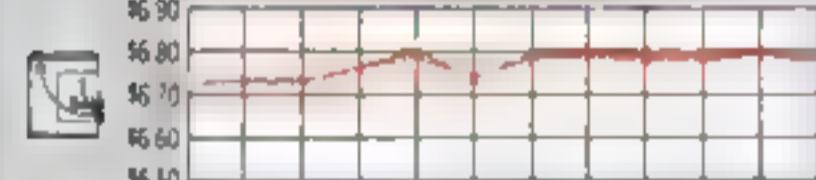
\$198

TIRE (6.70x15)



\$123.87

HOUSE PAINT



\$6.77

GASOLINE (REGULAR)



29.5¢

Sources: gasoline, National Petroleum News; all others, U. S. Bureau of Labor Statistics.

► Come-on advertising. This is worked primarily in big cities. Some examples: (1) A company sells sewing machines, with the phony offer to buy back piece-work done on them. This routine is also sometimes tried with power tools. (2) An ad claims the lowest of low prices. But at the store, you find the bargains are "nailed to the floor." Paint at \$3.75 a gallon comes in colors you wouldn't use on a dog house. But the salesman tries to unload full-priced products on you. (3) You buy an expensive item, say a car. You're asked to leave the sales contract with the dealer for checking. But they deliver a much cheaper model. And you have no contract to prove what you bought.

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Charles M. Garvey

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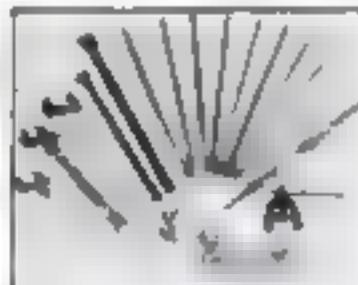
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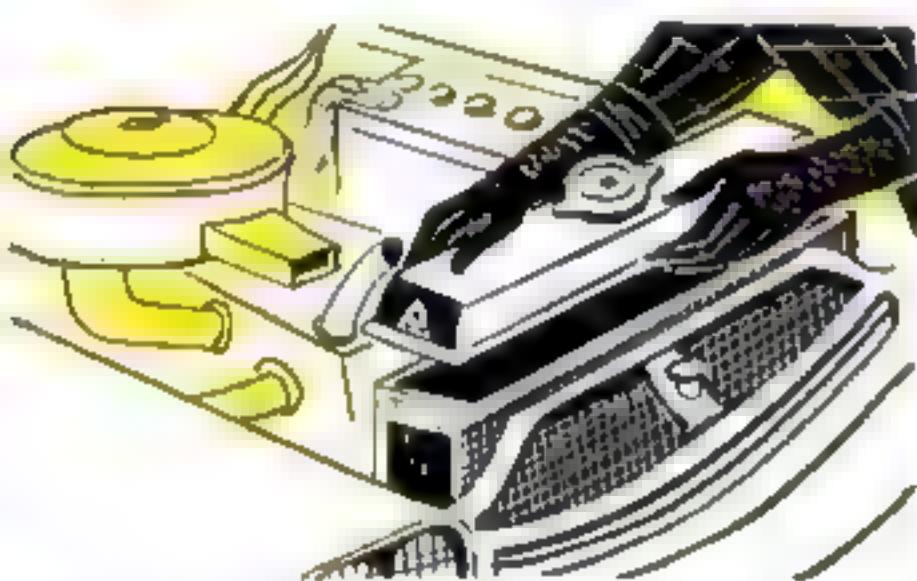


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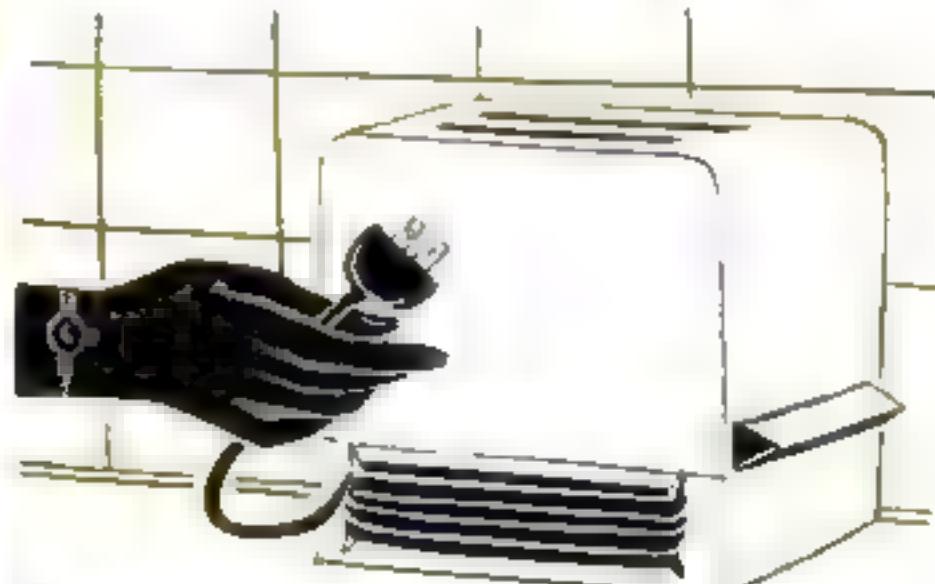
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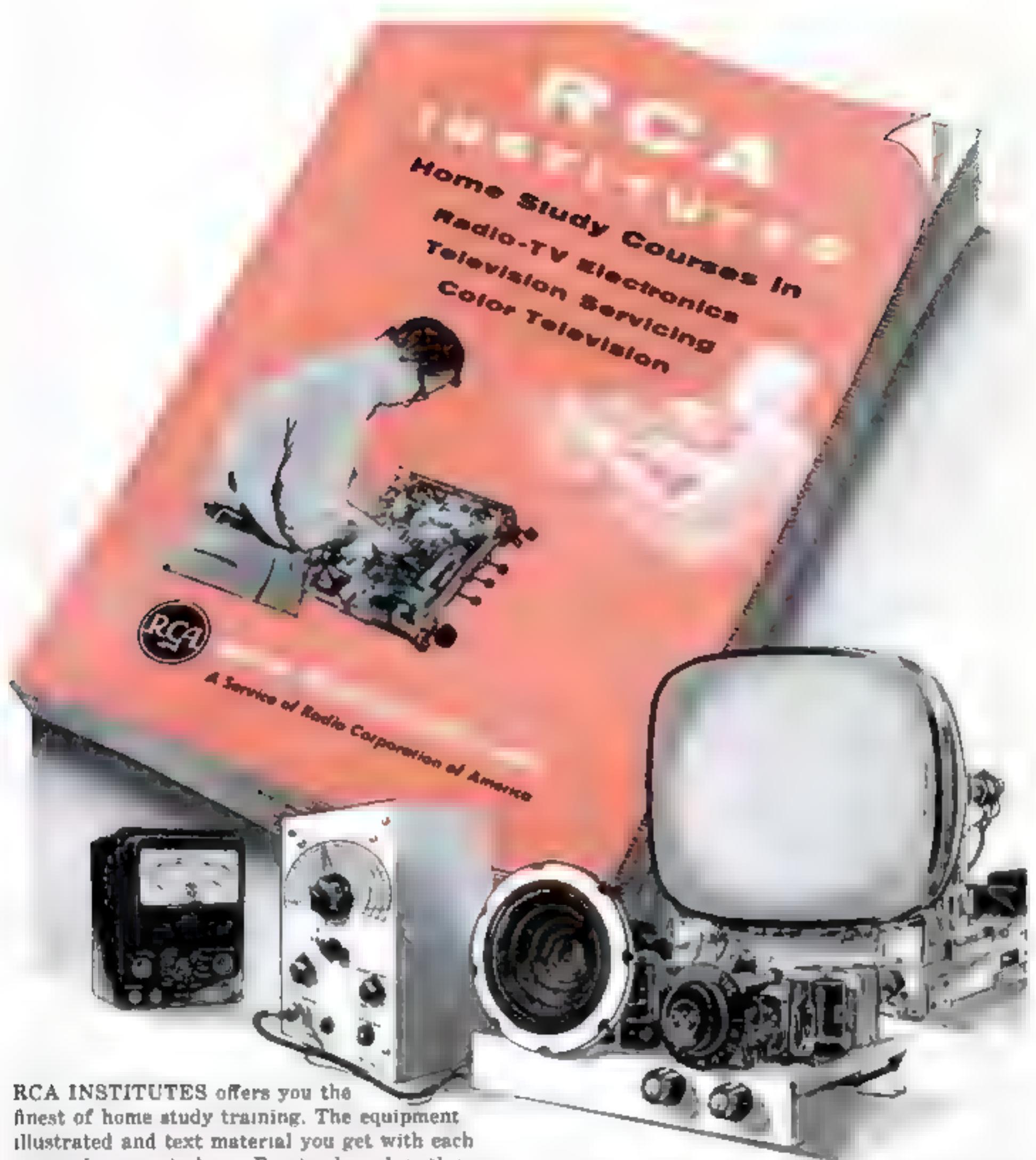
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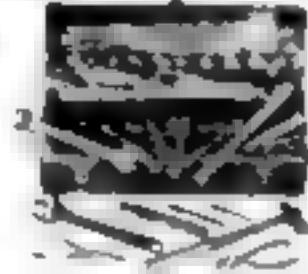
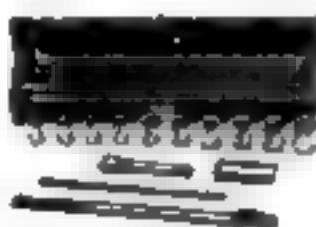
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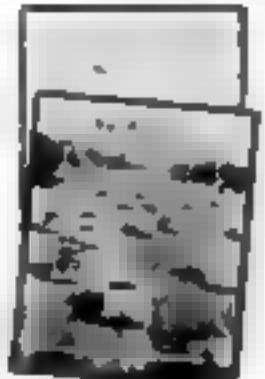
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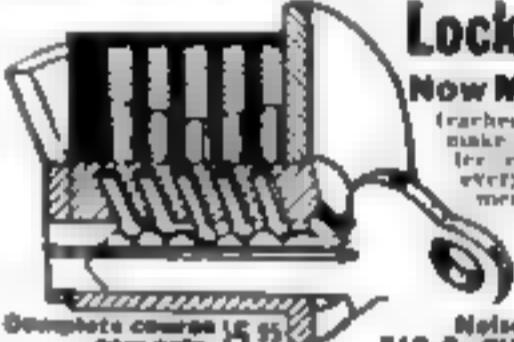


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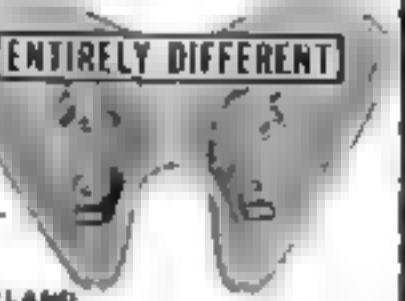
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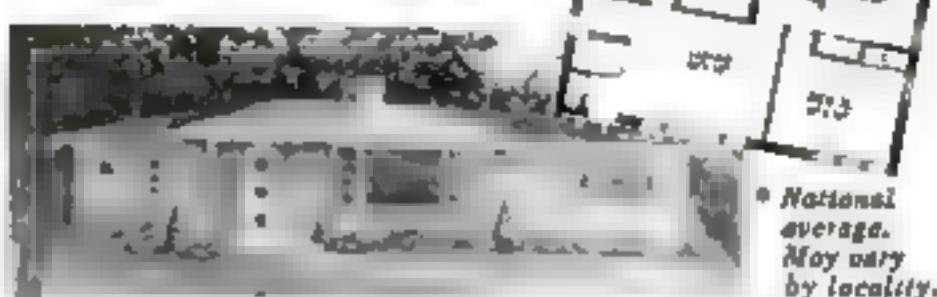
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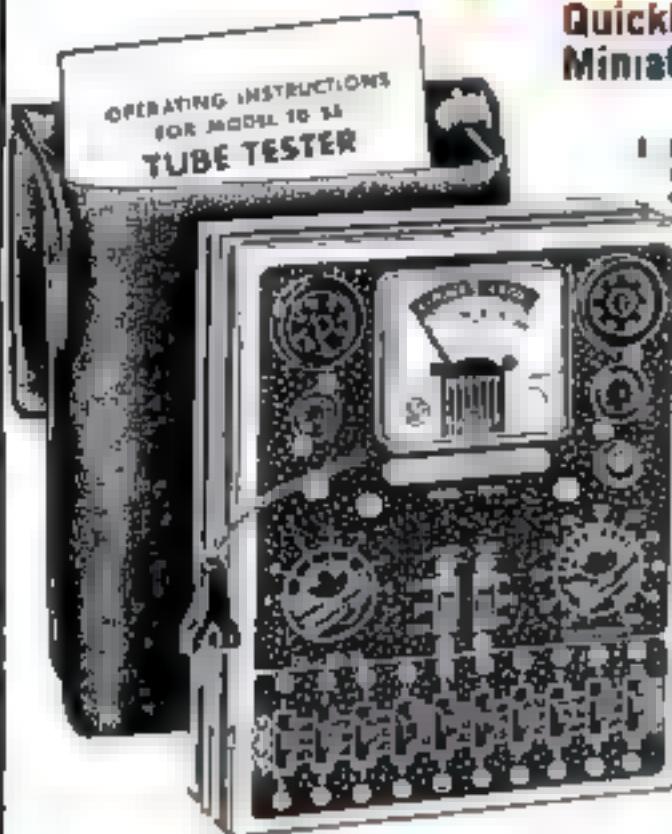
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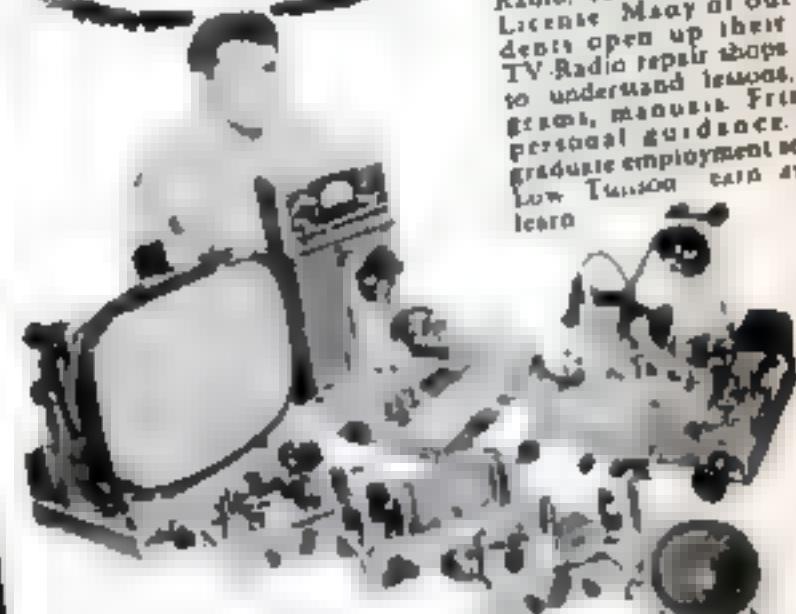
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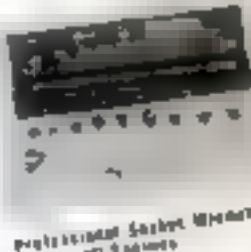
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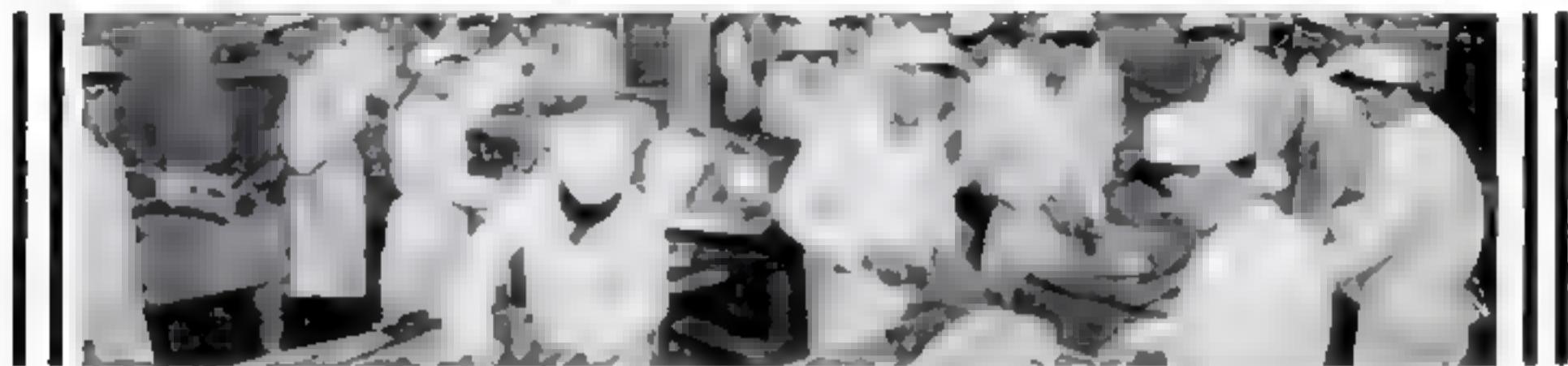
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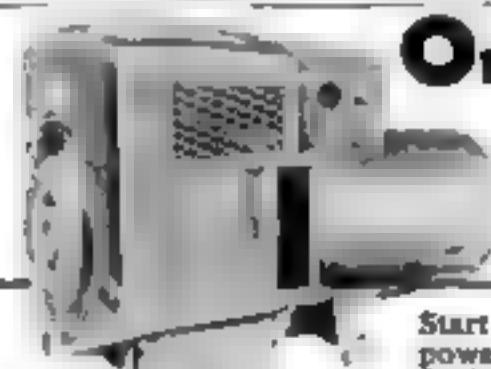
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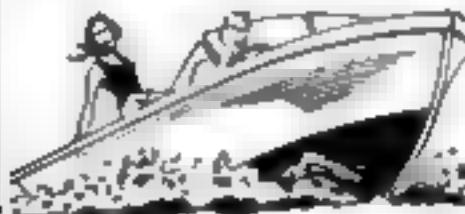
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Next Big Change in Cars: Flatter Floors

Each year, as cars get lower, that darned hump gets higher. How to get rid of it? Rear engines . . . transaxles . . . front-wheel drive?

By Hubert Luckett

SCREENED behind security precautions that are extreme even for Detroit, engineers are furiously pushing projects that will bring the first basic change in the anatomy of American cars since the industry came of age. Engines and transmissions of the mass-produced cars have always been in front, delivering push to the back wheels by a long shaft. Now, something new is in the wind.

What they are doing. Under the summer sun at proving grounds around Detroit, drivers are sweating out tests on other types of drives designed—guess where—in Europe, and cobbled to American cars. Meanwhile back at the ranch the cost accountants are totting up the discouraging figure on retooling.

These are the choices:

- Front-wheel drive.
- Rear-mounted engines.
- Independent rear-wheel suspension.
- Transmission and differential combined in the rear-axle assembly: transaxles.

Customer unhappiness with split-level floors in the family sedan is sparking this revolution in design. Ever-lower body lines have had powerful sales appeal, but owners are finding that those not-so-sleek obstructions in the floors are unpleasant to live with. The hump down the middle has grown larger with each lowering of the roof height until now the center seat is for children and midgets.

In this battle of the bulge, the engineers have resorted to all kinds of design tactics to let the stylists have their lower silhouette without too great a penalty in floor obstruction:

- Smaller wheels.
- Engines and axles tipped rakishly.
- Two-piece, three-joint propeller shafts.
- Lower hypoid pinions.

They've nearly run out of tricks. About the only thing they haven't

European designs are getting hectic attention as Detroit engineers scurry to catch up

tried is a switch on the old if-you-can't-lick-'em,-join-'em-theme suggested by one engineer—make the tunnels a little higher, use them for armrests and admit that they're building four-passenger cars.

The hypnotic spell cast on American designers by the logic of engine in front with rear-wheel drive is broken now. As long as the passenger compartment could ride atop the drive line, it made a certain amount of sense. But with the floors draped around the drive line now, and stylists eager for still lower roofs, Detroit engineers are scurrying to catch up on their homework.

The hottest possibility—the arrangement that is closest to getting the go-ahead for production—is the transaxle. This unit combines the transmission with the rear axle. With the transmission removed from its position of prominence, attached to the rear of the engine, the hump in the front floor would go. Then the prop shaft would have only the engine torque to deliver to the rear, instead of the torque after multiplication by the transmission, as at present. A smaller prop shaft could be used—beneath a smaller tunnel.

There's another saving on tunnel size, too. In present cars, the body is sprung weight and the drive line is, in large part, unsprung weight. There must be room for the rear of the prop shaft and the differential to move upwards when you hit a bump—without banging the floor pan. Today's tunnels have to afford five to six inches of "jounce" clearance.

Transaxles would probably be combined with independent rear-wheel suspension. Only the wheels would move up and down when you hit a bump. The drive-line components would be fixed to the body so that there would be no relative motion to be accommodated.

The attraction of all this is not just that it would solve a style problem. It would also:

- Distribute weight better. Today's cars tend to be light on the rear wheels unless fully loaded. With the transmission moved to the rear, the balance would be better.
- Lower the center of gravity.

- Improve traction. In addition to more weight on the driving wheels, the prop-shaft torque effect that makes one rear wheel want to spin under extreme conditions would be eliminated.

- Give a better ride. Some engineers say unsprung weight could be cut in half. This would mean not only an improved ride, but also a more easily controlled one—less load and wear on the shocks.

- Improve handling. The difference in handling under power between a left and a right turn (due to the twisting effect of the drive shaft on the unsuspended, rigid rear axle) would be eliminated. The car would hold the road better in fast cornering and braking.

- Make better brakes possible by using inboard brakes. This is not a necessary part of the transaxle package, but while getting rid of unsprung weight you may as well save the weight of the brakes, too. Brake cooling might be better. Brake torque reaction, which currently tends to pretzel the rear springs in a hard stop, would be taken directly by the frame.

Of course you don't win all this without pain. As usual with a new development, you can get more "proof" from the engineers that the idea is impractical or undesirable than information about how it can be done and its advantages. Allowing for the usual pessimism, disadvantages boil down to these:

- It's expensive.
- Transmission controls would have to be extended back to the rear end.
- Station-wagon bodies would pose a problem: They need an uninterrupted floor at the rear.
- It would rob space from the trunk compartment. There would have to be a bulge in the floor of the trunk to make room for the transmission and still maintain ground clearance.

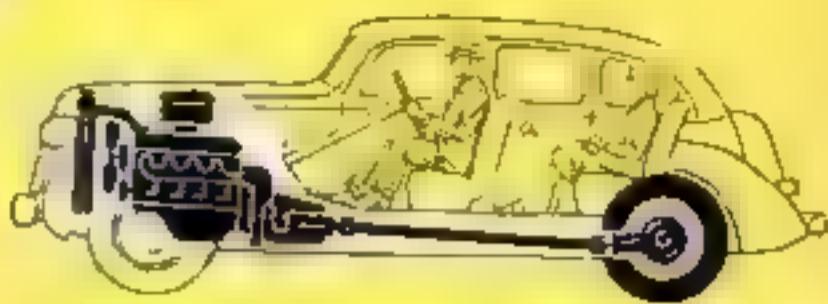
- It's expensive.
- Weight goes up. Although the unsprung weight would be reduced, designers estimate an increase in total weight of 25 to 50 pounds.
- It doesn't completely dispose of the floor obstructions—it only reduces them.
- It's expensive.

If, as some engineers contend, trans-



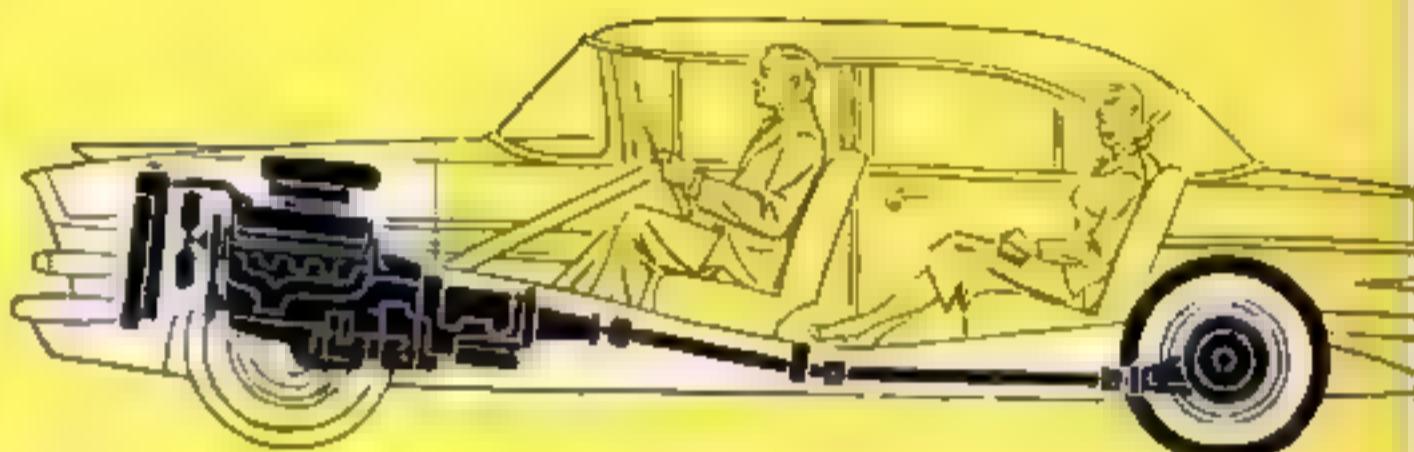
PASSENGERS PERCHED atop the running gear back when floorboards were actually boards—floors were flat.

FLOOR HUMP CAME with the first lowering of car heights. Hypoid pinion and two-joint prop shaft helped keep it small and scarcely noticeable.

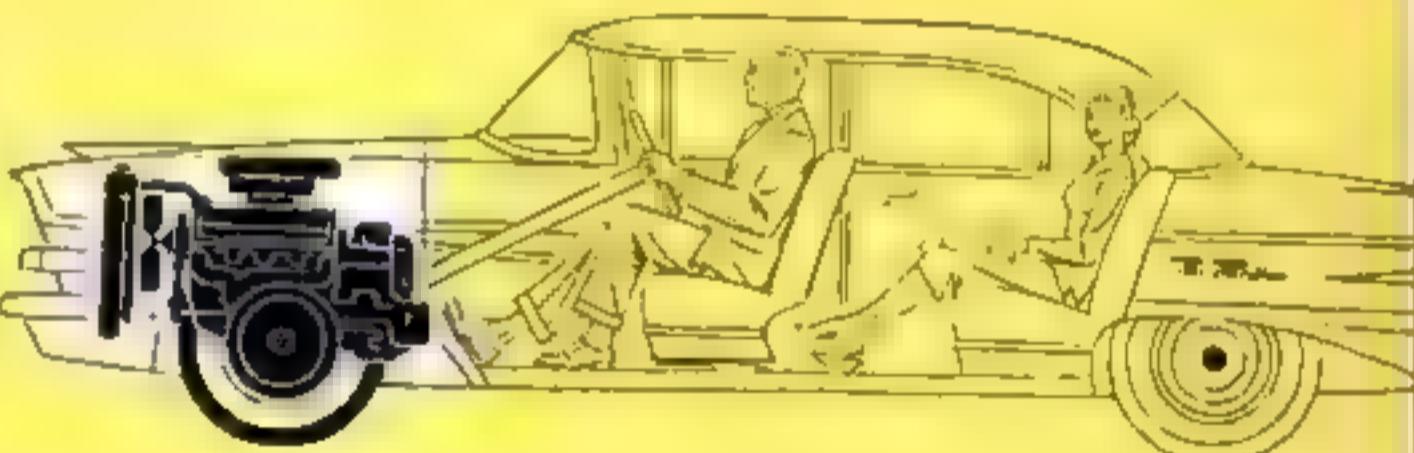


How the Auto Got Its Hump—and What Can Be Done About It

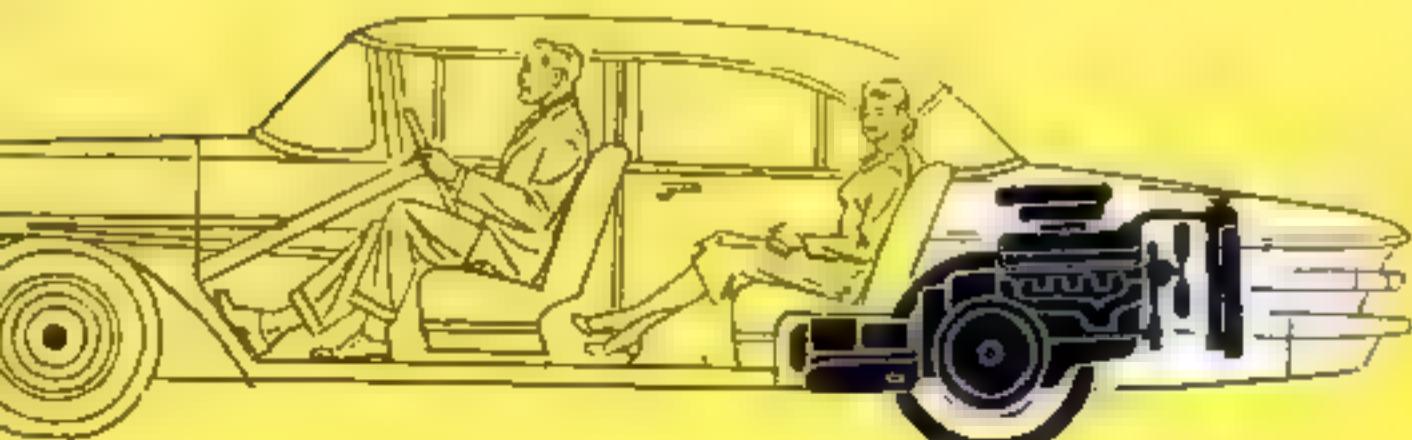
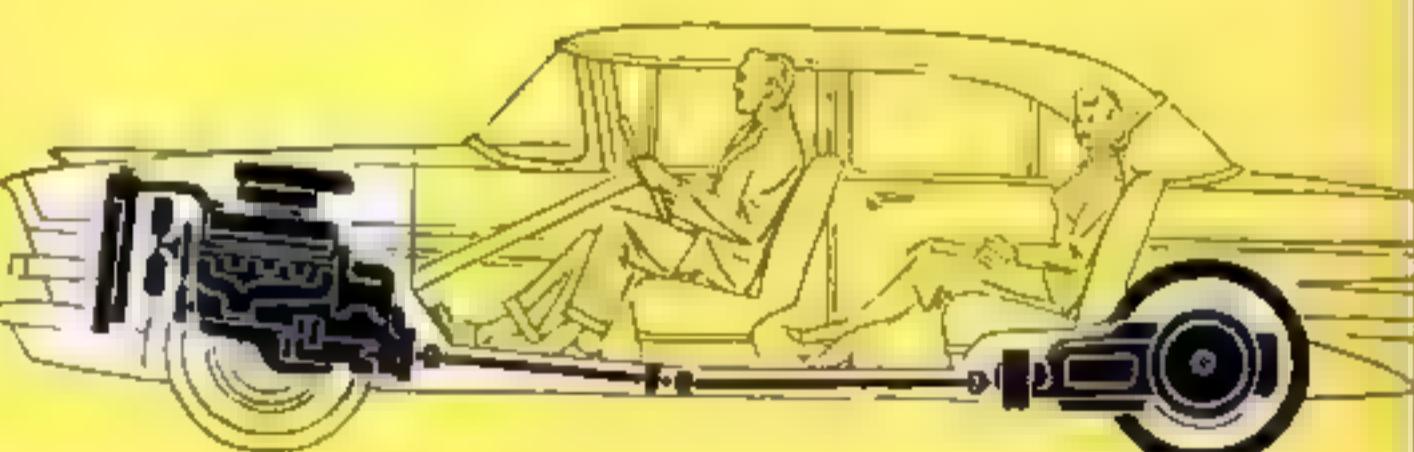
LOWER HYPOIDS and three-joint prop shafts have been resorted to in the latest low-slung beauties, but even so, today's passenger compartment is draped around the drive line, leaving a swollen hump down the middle.



FRONT-WHEEL DRIVE licks the problem of the bump by avoiding the cause. With no drive line underneath for which clearances must be provided, floors can be flat, even with lower silhouettes.



TRANSAXLES are the latest (and most likely) proposal. With the transmission moved to the rear axle, the tunnel could be reduced and that hump would go. Floors would be almost unobstructed.



REAR ENGINES offer the same clear floor as front-wheel drive, but weight distribution is a serious problem. Lighter engines would be a must to make this scheme feasible.

The floor hump must go . . . Most likely solution: the

axles are not the best answer, what about the other possibilities?

Independent rear-wheel suspension is all you need—so one argument goes. Leave the transmission where it is. You would still get many of the ride and handling advantages. Retooling costs would be less and there would be no problem with station-wagon bodies.

The trouble is that this would do little or nothing about the problem that started all the fuss: the transmission hump in the front floor. And it would gain only a modest reduction in the tunnel.

Nevertheless, this possibility is getting serious consideration in some quarters. Chrysler has been experimenting with a trick that may hold part of the answer. They've tried moving the transmission just far enough to the rear so that the hump is tucked under the front seat.

The obvious answer to the problems created by having to provide clearance for the drive line under the passenger compartment is—not to have a drive line there in the first place. Of course this means either a front-drive or a rear-engine car. Both these schemes have been thrown up to Detroit engineers so many times during the years when their dogmas dominated all designs that the mere mention of either triggers a fusillade of ready-made objections. You'd think no such vehicle had ever run. But there are at least a dozen front-drive cars and half a dozen rear-engine cars made in Europe. They work—and please the customers.

Recently Peter Kyropoulos of General Motors told the SAE "The pros and cons of front-wheel drive, as well as the rear engine, have been discussed with more emotion than common sense. Neither arrangement poses insurmountable problems . . ."

Front-wheel drive gives maximum uninterrupted floor space. It is particularly well suited to station-wagon bodies. The complete power package including front wheels, steering gear and suspension could be built as a unit instead of hanging the various components on the frame piecemeal as now. With all the machinery bunched up front near the driver, engine and transmission controls would be short, direct, and well protected.

However, the concentration of the

heaviest parts in front is a drawback. It is generally conceded that the ideal weight distribution is 50-50—equally divided between front and rear wheels. Practically, this is rarely achieved in a family car. When there is variation from the ideal it is better to have the front end slightly heavier for best stability. But, with the big engines shoved well forward in the present Detroit cars, they are already too nose-heavy for good handling with only one or two passengers aboard.

Steering the driven wheels is also a problem—especially when they are geared to the bigger engines customary in American cars. When you transmit torque through a U joint, a force is created that makes the input and output shafts want to line up in a straight line. The more torque you apply, the stronger this force is. You have experienced this effect if you have ever used a U joint on a socket wrench. The harder you twist, the more effort you have to exert to keep the handle from straightening out.

Durability of the U joints is another snag. They were the Achilles heel of the ill-fated Cord, the only American-made front-wheel-drive car to achieve a measure of success.

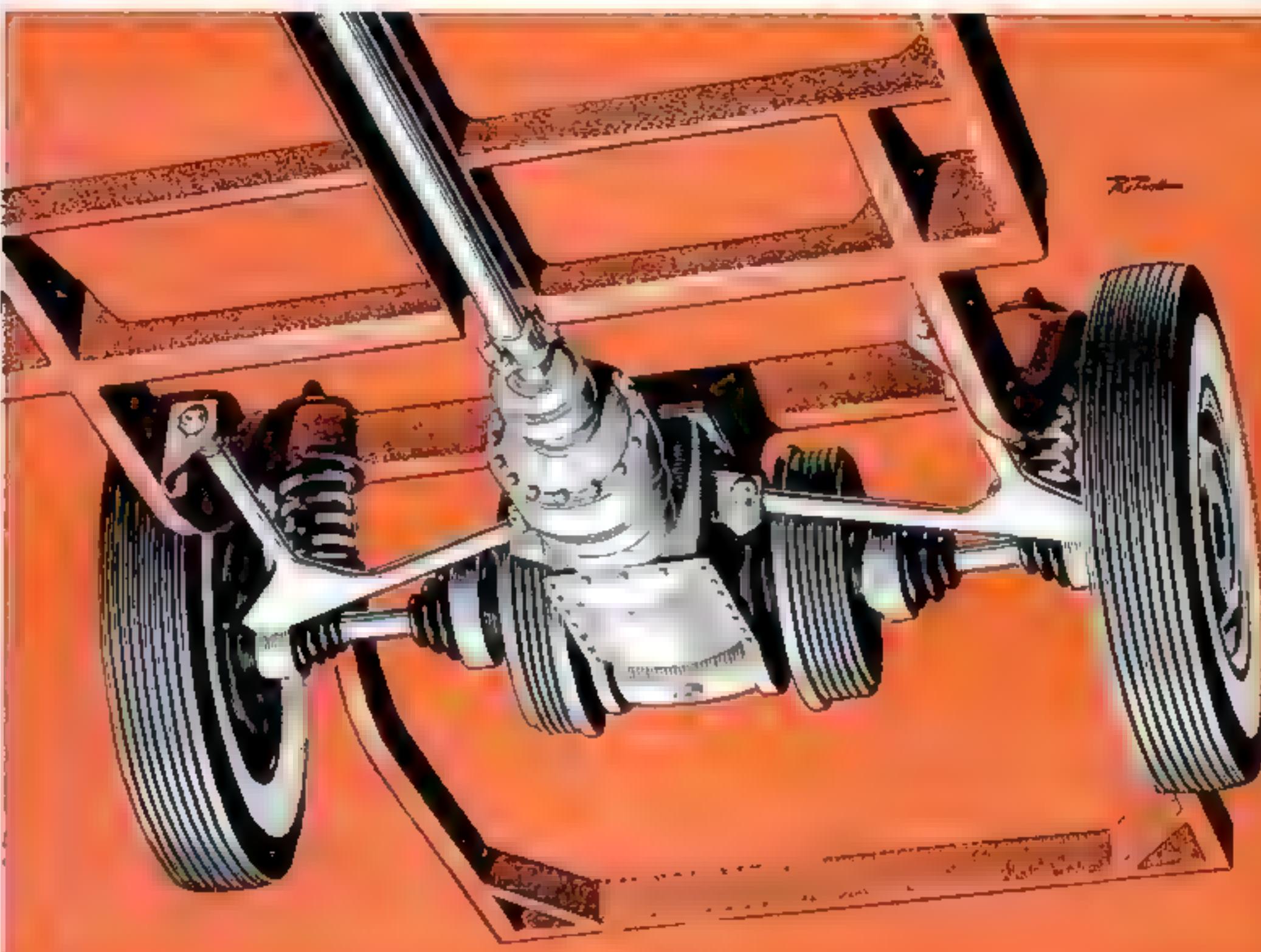
Still, according to most of the engineers consulted, there is no fundamental engineering reason why these problems can't be solved satisfactorily. They see the biggest objection in the need for mastering new driving techniques.

While the roadability of a front-drive car is, in many respects, superior to that of a rear-drive one, there is a difference in the handling. In many driving situations, those all-important quick reactions needed to stay out of trouble are just the reverse of the ones called for when the rear wheels are driven.

For example: Suppose you find yourself—in your rear-drive car—in a turn going a little too fast. You are on the verge of a skid. Your corrective steering is into the skid or opposite to the way you were going. But if the driven wheels are in front, the correction is a harder turn in the direction you were headed.

In practice, however, such objections may very well fall by the wayside just as did similar objections to power steering when it was still untried.

transaxle—transmission combined with the rear axle



TRANSAXLES would permit a badly needed transfer of weight to the rear wheels. Unsprung

weight could be reduced by using inboard brakes and individual rear-wheel suspensions.

Rear-mounted engines will also banish the drive line under the floor without incurring the problem of steering the driven wheels. So far as this factor is concerned, the handling would hold no surprises for the American driver. This makes it an inviting prospect.

The big obstacle is the overweight engines now used. The best weight distribution you could hope for with present engines is about 40-60. Such a tail-heavy car would be even less stable than one heavy in the front.

When you add three more problems—the extension of the engine and transmission controls forward, unsuitability for station wagons, lack of luggage space—the rear-engine car seems the least likely

arrangement to get the engineers' nod.

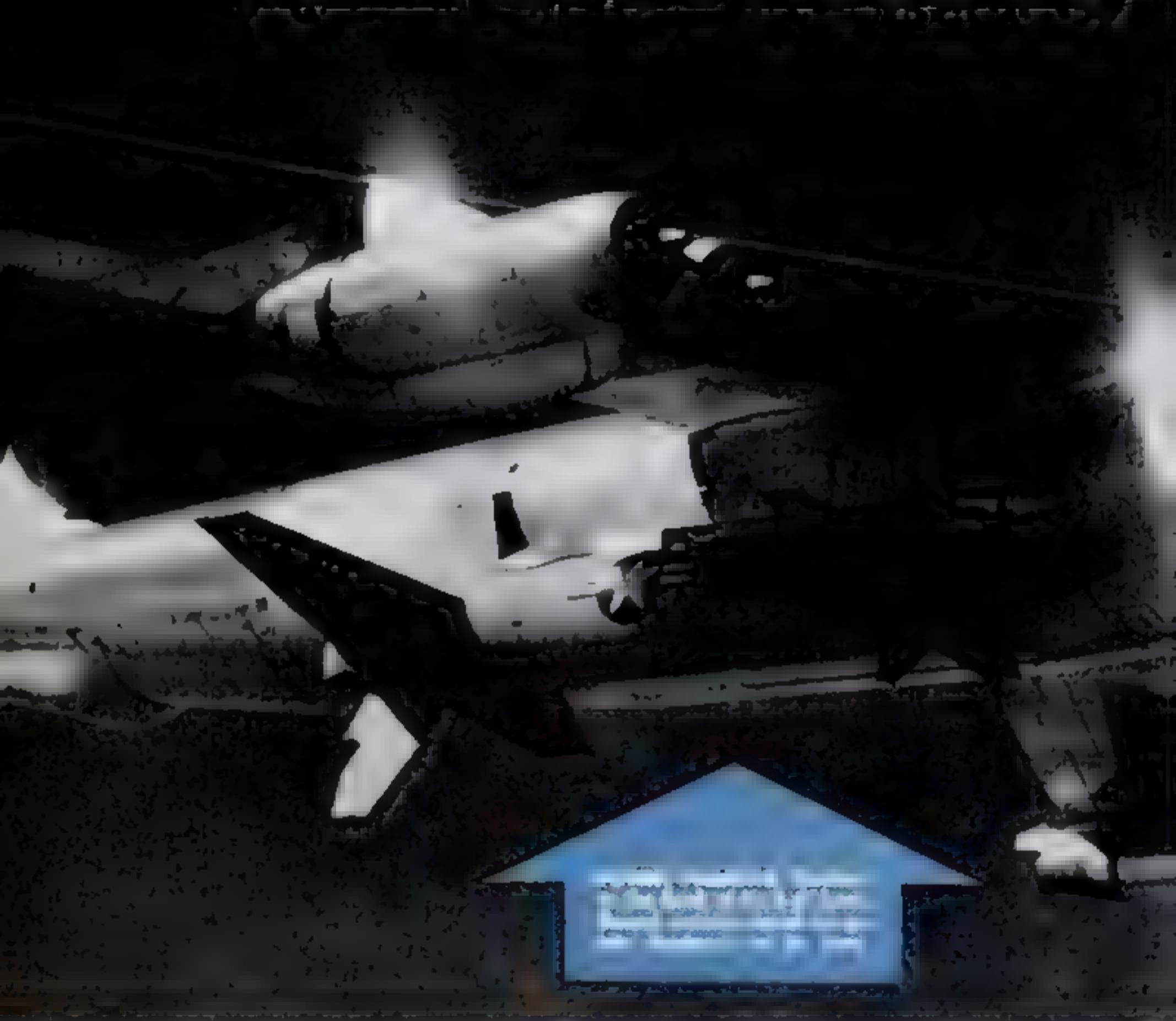
Almost all evidence coming out of Detroit indicates that the decision has been made—the hump has to go. The only question is how soon and by what route. Reliable reports say GM has developed the transaxle to the point where they are conferring with machine-tool makers for the machines to produce them. Ford is apparently giving front wheel drive much more than a casual study—possibly for use on a smaller car.

Best estimate for the earliest models that will show any of these innovations: 1961. If business continues to lag, however, a crash program might get the transaxle into a 1960 model, to give sales a much needed needle.

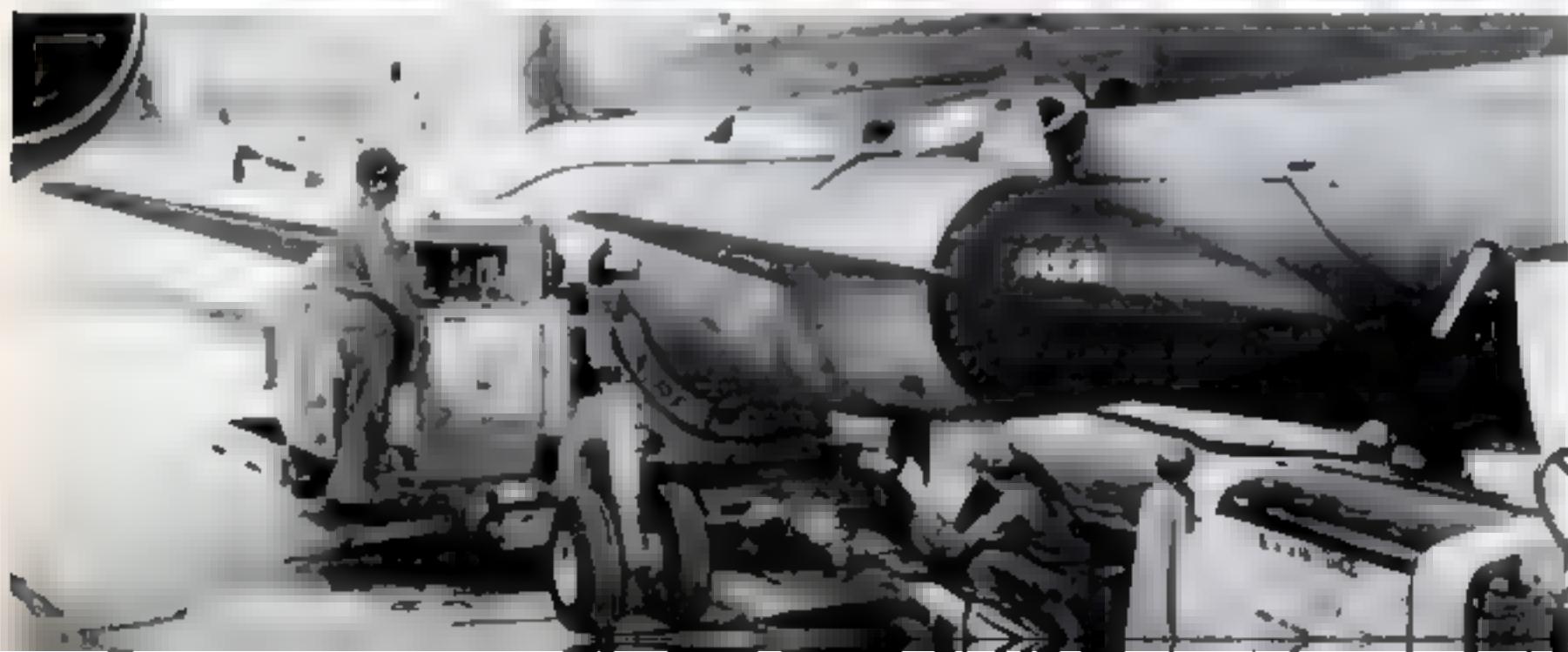
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PS Exclusive

New U.S. Missile



Mating missile to bomber, crewmen hang it under right wing. Now nitric acid is pumped in.



Is Launched from Bomber

U.S. AIR FORCE

By Frank Harvey

A STRATOJET bomber piloted by Maj. Arthur Roberts and Lt. Hal Howes left Eglin Proving Ground in Florida, flew by a secret route to the New Mexico desert and dropped a huge pink object with fins on nose and tail. The pink object fell free. The airplane turned violently homeward.

Bright fire squirted from the tail of the

pink shape and it began a smooth high-speed climb toward the deep purple of outer space. The fleeing bomber was not yet through with its pink bird. Maj. Ellison Thornton, the navigator-bombardier, crouched in his cubbyhole controlling the missile's flight path.

Seconds passed and grew into minutes as the jet bomber sped away from its departing weapon. Then Thornton, who'd been guiding the flying bomb from the in-



Launched but still under orders, the "Crew Saver" falls away, freeing plane to head home.

stant he'd released it, pressed his "dump button" and the missile jackknifed and screamed down on a target more than 75 miles away.

"Run complete," Thornton announced on the intercom. "Looked good."

The bomber snored onward at high altitude. Presently, in the blue distance ahead, a KC-135 jet tanker appeared. Roberts eased in behind, hooked up, and filled his tanks. In due course the two planes landed back at Eglin and learned they'd made an excellent hit on the target—good enough to have wiped out an enemy city if their weapon, the Bell guided missile known as the Rascal, had been armed with its hydrogen warhead.

The Rascal's bull's-eye was reported in detail on the front page of the *Eglin Eagle* when POPULAR SCIENCE photographer Bill Morris and I arrived to cover the story. It might have been easy to jump to the conclusion that the Rascal is the answer to a bomber crew's prayer: You fire while still out in the boondocks, whip around and hike for home at near sonic speed, relatively safe from the enemy fighters and missiles to be expected near a key target. This, of course, is the philosophy behind the Rascal.

The Rascal is one of a large and fast-growing family of guided air missiles: the Green Quail, Hound Dog, Goose and Genie, to name a few. These birds have a bewildering and deadly capability. Some act as decoys, confusing enemy radar and interceptors. Other birds detach from a bomber and take off after fighters like

striped-tailed ducks. Still others, like the Rascal, zoom ahead at supersonic speed carrying an awesome nuclear punch to heavily defended targets.

The hard facts on Rascal are simple: range, over 75 miles; speed, supersonic; warhead, nuclear; length, 32 feet; diameter, four feet; accuracy, 1,500 feet; power plant, rocket engine; flight control, guidance from mother plane.

Growing pains have been serious. The Rascal didn't get perfected overnight. More than 50 propellants were tested before Bell settled on JP-4 jet fuel and fuming nitric acid. JP-4 is ideal because it's available in quantity at most Air Force bases. Fuming nitric, on the other hand, isn't ideal by a long shot—but it's better than some other fiendish liquids that tend to explode unexpectedly.

Bell safety-engineered the fuming nitric acid with great care. Not a drop is supposed to reach open air during a fueling. The crew rolls its big nitric truck up to the bird, which is already fueled with JP-4 and attached to the flank of a bomber. The armored nitric hose is then attached and checked for leaks before the ticklish transfer is begun.

To make things doubly safe, fuel handlers are covered from head to foot with protective gear. But minor slips do happen. Airman First Class Conally Stansell of Morrow, Ga., showed a festering yellow-and-green acid burn on his forearm. He got it when acid spilled during flushing out of a missile that had returned from a flight without being fired.

"We never worry about the fueling," Stansell said. "It's getting the miserable stuff out again after an abort that's dangerous. Takes us an hour to put it in—and about 10 hours to get it out again."

Had he noticed the burn at once?

"Would a person notice a white-hot coal if somebody stuffed one up his sleeve?"

Stansell's buddy, Airman First Class Jake Snyder of Bristol, Tenn., related a frightening experience. During the flushing of a missile he'd got a dash of acid in the face (having lifted his mask to get a breath of fresh air). "I had sense enough to keep my eyes tight shut," Snyder says, "and the boys ran me over to the eyeball washer and stuck my face in it. No sweat. They worked so fast I didn't even end up with a scar."

Putting the bird aboard. One thing an observer wonders about is the really immense detail necessary to get the Rascal into the air. The big birds are brought to Eglin Proving Ground snuggled up in the belly of a converted B-50 bomber. The bomber is towed backwards over a concrete pit. A special missile carriage (known as the "miscarriage" to cynical offloaders) accepts the missile and trundles it into a large building where technicians await it.

Clustering around it like flies, they undress it as much as possible and peek into every cranny, looking for maladjustments. Then they button it up again and put it through a propulsion check, using a machine that simulates every phase of firing the rocket power plant. Next the bird is rolled over to a large yellow machine that gives it the electronic once-over—simulating all guidance functions.

Loading is relatively easy. The JP-4 jet fuel is put in while the bird is still in the missile area. The dummy warhead is attached, and the bird taken out to the aircraft and fastened to the right side on a

special bracket. An impressive array of fire trucks, an ambulance, and a small army of rescue men wearing safety suits and oxygen-breathing equipment accompany the missile to its "mating."

The nitric acid (which supplies the oxygen necessary to burn the JP-4) is pumped in. Then the final and most dangerous step—pressurization with high-pressure nitrogen—takes place. A truck hooks up to the fully fueled missile and bleeds nitrogen into various internal pressure vessels that will expel the propellants into the motor at the proper time. An overfill here could result in a rupture that would inadvertently mix the nitric and the JP-4 and might cause a boom that could be heard all up and down the Florida panhandle.

"We've never had an accident," says Lt. Bob Weir, the assistant missile maintenance officer. "I doubt if we'll ever have one; we really respect the materials we work with. Know what I mean?"

I knew in a general way, but Weir then explained that white fuming nitric acid and hydrazine (the spark plug of the engine) unite in what's called a "hypergolic" reaction.

"What's that?" I asked.

"They explode," Weir said, grinning.

A cylinder about two inches in diameter and eight inches long, containing hydrazine (and known as a slug), is placed in the lines leading to the rocket engines. At the time of firing in the air, a tiny diaphragm breaks and lets the nitric acid hit the hydrazine. The hypergolic reaction takes place. The JP-4 squirts in from another line under nitrogen pressure, and the explosion becomes a steady rocket fire. The Rascal is now in business on the power phase of its climb.

Flying a B-47 with a missile hooked to its flank is not difficult after a pilot gets accustomed to it. But if anything hap-

Leading parade of its attendant vehicles, Rascal maneuvers into place for loading on B-47.





ACCIDENT INSURANCE THAT PAYS OFF FAST:
Emergency showers are on tap close to crew that handles hazardous fuel for the Rascal missile.



EYEBALLS AWASH, Airman Snyder averts crisis after careless splash of acid. Persnickety safety precautions cut risks to a minimum.

pened during the takeoff roll, serious trouble could result. The nitric acid probably would eat up a mile or so of concrete (only a drop or two under the nozzle of the aluminum-lined acid tank car had eroded a hole in the concrete there).

They've nicknamed the Rascal "The Crew Saver" because it eliminates the need for boring in through missiles and screeching enemy jets. Pilots and bombardiers are naturally enthusiastic. Of course 75 miles, at today's jet speeds, isn't very far out of town. But it's better than 10 miles, which is what the B-47 would have to do if it were undertaking a normal gravity drop.

The important thing to remember is the fact that the Rascal is a research weapon of great value. The lessons learned slowly and painfully with the Rascal can be quickly and easily applied to the newer air-to-ground missiles that are on the way.

One of these, the GAM 77 Hound Dog, will be carried by the Boeing B-52 intercontinental giant. Details on this bird are secret now, but we know for sure that it will have much greater range and carry an even bigger punch than the trail-blazing Rascal.

END



A British engraving pictured such news highlights as winged men and hut-building beavers.

The Day They Discovered Men on the Moon

The great newspaper hoax of 1835 fooled millions. Could we—in 1958—be taken in by such a fable brought up to date?

By George R. Price

IMAGINE that tomorrow morning some highly respected American newspaper—such as the New York Times—published an exclusive, front-page interview with a Russian scientist, a Dr. I. Marchenko, who has managed to escape to the United States.

He is being held incommunicado at an Army camp in Alabama—because the Department of Defense is afraid panic will

sweep the country if his story gets out—but somehow a reporter has managed to find and interview him. And there's a statement by "The Editors" that they know the story to be true—even though the Government will deny everything.

The Times interview—we're still imagining, remember—is to be published in three installments, and in the first installment Dr. Marchenko reveals that three times—in December, 1957, and February and March, 1958—Russia faked un-

With the fourth installment, the little upstart Sun



ITALIAN ARTISTRY created this picture of a winged moon man to run with the story. Note the addition of a smoking lunar Vesuvius.

successful ICBM tests to confuse the U.S. radar in Turkey, while shooting manned rockets to land on the far side of the moon. The first rocket crashed, but the second and third were successful. Dr. Marchenko was in the second rocket, and he describes its takeoff and the flight through space.

Later, our imaginary Dr. Marchenko tells about the landing on the moon—where they name their camp Khrushchevgrad—and about how they start exploring the surrounding territory. Soon they discover a region where carbon dioxide and carbon monoxide gases well up from fissures in the ground, and within the fissures strange lichens grow to six or eight feet.

THEN the third rocket arrives, and they press their explorations farther. They climb down inside some of the fissures, and find many different animals that live off the plants, breathing the carbon monoxide. There are little blue animals somewhat like chipmunks, and slow-moving, leprous white animals the size of St. Bernard dogs. And finally, a half-mile down inside the largest fissure, they discover chambers excavated in the rock, their walls lined with a luminescent ceram-

ic, and their furnishings indicating a high level of intelligence. But they can find no trace of the inhabitants.

In the final installment, Dr. Marchenko tells how he returned to earth, escaped through East Germany into West Berlin, and was flown to the United States in an Air Force plane. And the newspaper announces that its circulation has now passed the $5\frac{1}{2}$ million of *Pravda*, and is the largest in the world.

If this were to happen, would you believe the story?

It's easy to say no, but actually—not quite 125 years ago—millions of people in America and Europe believed a much more extraordinary story about the moon. This was the famous "Moon Hoax," probably the most successful newspaper hoax in history. Let's take a look at what happened then to see why it was so successful.

IN THE fall of 1833 the famous astronomer Sir John Herschel left England bound for the Cape of Good Hope with a shipload of optical instruments, to set up an observatory and map the stars of the Southern Hemisphere. The first report the United States received about his findings came in the *New York Sun* on Friday, August 21, 1835:

CELESTIAL DISCOVERY

"The Edinburgh [Scotland] Courant says—'We have just learnt from an eminent publisher in this city that Sir John Herschel, at the Cape of Good Hope, has made some astronomical discoveries of the most wonderful description, by means of an immense telescope of an entirely new principle.'"

Then, four days later, this headline appeared on the front page of the *Sun*:

GREAT ASTRONOMICAL DISCOVERIES.

**LATELY MADE
BY SIR JOHN HERSCHEL, LL.D., F.R.S., &c.**

At the Cape of Good Hope

[*From Supplement to the Edinburgh Journal of Science.*]

The *Sun* explained that "a medical

announced it had the world's largest circulation

gentleman" from Scotland visiting New York had with him a copy of the "Supplement." He had seen the item about Herschel, and had given his copy to the *Sun*, which was going to reprint this historic scientific article—written by Dr. Andrew Grant, Herschel's principal co-worker at the Cape of Good Hope and a well-known scientist in his own right.

The first installment was largely devoted to the extraordinary new telescope, with its colossal 24-foot, 14,826-pound lens that gave 42,000-fold magnification, followed by a microscope that magnified thousands of times more. To eliminate the difficulty that the more an image is magnified the fainter it gets, Herschel focused the first image from the telescope on a polished glass plate, and illuminated it by the intense light from a piece of lime heated by a hydrogen-oxygen flame. Then this brightened image was further magnified by the microscope, and projected onto the wall of the observation room (as on a motion-picture screen).

IN THE second installment, the wonders began, as Sir John and his assistants took their first look at the moon through the new telescope on the evening of January 10, 1835. First they saw an area covered with greenish-brown basaltic rock, and then suddenly they came upon dark-red flowers like rose poppies—the first signs of life on the moon!

A little later they found forests of trees looking like English yews and firs. Next—they explored the area known as the Mare Nubium (the "Sea of Clouds") of Riccoli. . . . fairer shores never angel coasted on

a tour of pleasure. A beach of white sand, girt with wild castellated rocks, apparently of green marble . . . feathered and festooned at the summits with the clustering foliage of unknown trees, moved along the bright wall of our apartment until we were speechless with admiration."

Then came a region of great amethyst crystals 90 feet high. And finally they discovered the first animal life: herds of "brown quadrupeds" like bison; unicorns



MOONSCAPE STAGE SET from a New York "Panorama of Lunar Discoveries" appeared as an engraving in the *Sun* on October 16, 1835.

of a "bluish lead color, about the size of a goat;" water birds and "a strange amphibious creature of a spherical form, which rolled with great velocity across the pebbly beach . . ."

In the third installment, the zoological list grew. Even more fabulous animals were added: "a small kind of reindeer, the elk, the moose, the horned bear," an "elegant striped quadruped about three feet high, like a miniature zebra," and—most astonishing of all—the "biped beaver," which had no tail, walked erect on its hind legs, and built huts with tall

chimneys, out of which smoke emerged.

BY THIS time New York was wild with excitement, and little else was talked about except the amazing moon discoveries. And when the fourth installment was published, on August 28, the little, upstart New York *Sun*, not yet two years old, announced that it had the world's largest circulation—19,360, against 17,000 for the great London *Times*, founded 50 years earlier.

The sensational event in the fourth installment was the sighting of the first lunar men, which the account named the "Vespertilio-homo," or "man-bat": "They averaged four feet in height, were covered, except on the face, with short and glossy copper-colored hair, and had wings composed of a thin membrane, without hair, lying snugly upon their backs, from the top of their shoulders to the calves of their legs."

There were still two more installments, and the wonders continued. A solid quartz crystal 340 miles long, hills of "snow-white marble," a "tall white stag with lofty spreading antlers black as ebony," great temples of polished sapphire, with roofs of yellow metal supported by sapphire columns 70 feet high, and "lovely green valleys . . . of paradisiacal beauty and fertility, and like primitive Eden in the bliss of their inhabitants." And at the very end of the last installment the astronomers reported a highly superior race of the man-bats, "of infinitely greater personal beauty . . . scarcely less lovely than the general representations of angels by the more imaginative schools of painters."

Such was the amazing story that began to spread, first through America, and then around the world. And everywhere it went, it was reprinted in newspaper or pamphlet form, with translations into French, German, Italian and many other languages.

But how many people actually believed it? According to one contemporary writer, in America "not one person in 10 discredited it." True, some New York newspapers promptly charged that the whole thing was a hoax. But people knew that papers were such bitter competitors that occasionally rival editors would assault each other on the street. So of course the other papers were jealous of the *Sun* for its scoop, and called it a hoax. And so

even when the *New York Herald* stated that the Edinburgh *Journal of Science* had gone out of existence a few years earlier, and identified the author of the moon story—correctly, it later proved—as Richard Adams Locke, the *Sun's* star reporter and a brilliant graduate of Cambridge University, still many people continued to believe in the moon discoveries.

WHY was this extraordinary hoax so successful? At least five different reasons can be assigned:

- People everywhere and at all times like to hear about and believe in the miraculous and unusual.

- The story was ingeniously presented, starting with the brief announcement, and then gradually building up through the telescope, the red flowers, and the conventional animal types, before introducing very strange animals and "man-bats."

- The technical details about the telescope impressed people, so that they assumed that if something seemed improbable, it was just because they did not understand it.

- The article named real men like Herschel, real areas on the moon, and specific dates, and this sprinkling of reality and specific details made the fantastic part seem true.

- Finally, the hoax was aided by some unexpected happenings. For example, one day a distinguished-looking elderly gentleman told the crowd gathered outside the *Sun* Building that he had himself seen the gigantic lens being loaded on shipboard at the East India Docks in London. (Locke, in the crowd, was flabbergasted.)

Of course if people had known more about science in those days, they could have quickly detected the fraud. The most obvious error was in claiming that the moon had seas and an atmosphere dense enough to support winged flight. Also, the gigantic telescope was completely absurd. To shine a bright light through a faint image would simply wash out the image instead of making it brighter. Finally, the whole story about life on the moon was just a little too pat, with its picture of unicorns, Gardens of Eden, and beings who looked like angels.

What does this mean for us today? Now, just as much as ever, people are eager to believe in the strangest and most

[Continued on page 218]

First Iron Curtain Car on Sale in U.S. Czech-Built Skoda Uses Aluminum Engine

***Engineering features you'd expect only on a costlier car
give this little sedan a solid feel and perky personality***

CAR-CONSCIOUS Americans are getting their first close look this summer at an automobile built on the far side of the Iron Curtain and shown in this country, not as a curio, but as a consumer product actually available in the U. S.

What they're seeing—leaving politics out of this—is quite a piece of hardware for its \$1,595 price tag.

You'll find a comfortable familiarity about the Skoda's looks: The rounded, blunt nose and notch back are scaled-down Detroit, circa 1950. According to the importer, Continental Car Combine, about a thousand of these cars have been quietly sold in this country in the last year to test their acceptability to Americans. Current plans are to import the car in quantity.

Your reactions to the Skoda depend almost entirely on the prejudices you bring along on your first ride. The ride is very firm; in fact—let's face it—it's downright rough on posteriors pampered by pillow-y American-made cars. But, if driving is fun as well as transportation for you, you will quickly forget about the bumps, in your delight with the way the car handles. Your first 10 minutes behind the wheel make you want to hunt up winding country roads just for the fun of taking the turns.

Steering is quick, precise, and very light. Even in parking, the 16-inch steering wheel can be cranked with surprising ease the $1\frac{1}{2}$ turns required for full left or full right. Over 30 m p.h. there is slight oversteer that is uneasy-making until you get used to it.

Shifting among the top three gears



Skoda 440 two-door sedan has conservative lines but still looks at home on American highways.

can be indulged in with abandon. Synchronization is excellent. Minor frets: rude, truck like noises in low gear, excessive gear hum in third, and an exasperating willingness of the column-mounted shift lever to drop into the reverse slot if you absentmindedly revert to three-speed shift pattern.

Performance is sprightly. This was so even on the test car—a two-door sedan, series 440, not yet broken in, with only 300 miles on it. The car seemed a trifle more able at low r.p.m.'s—more forgiving of negligence in downshifting—than the VW, although top speed is about the same, 68-70 m.p.h. The four-cylinder, OHV, liquid-cooled 40-horse engine started readily after a nippy, drippy night at the curb, but was reluctant to assume its chores until after a three-to-four-minute warm-up. A canvas-curtain air shutter behind the radiator assists in warm-up and for driving in very cold weather.

Old-timers will get a twinge of nostalgia from the businesslike hand crank supplied and the hand-operated lever on the fuel pump for priming the engine. A "zero starting device" turns out to be the manual choke.

A three-day check on mileage for typical commuter driving showed miserly fuel consumption—28.6 m.p.g. On the

open-road the car should live up to its maker's claim of about 35 m.p.g.

At the curb, the Skoda looks bigger than a Volkswagen although the wheelbase and overall length are identical. This impression of size is not all illusion. The trunk has 12 cubic feet of luggage space compared with a little over five for the VW, and the back seat a couple more inches of headroom. Curb weight is 2,050 pounds as against VW's 1,802. Visibility is excellent and contributes to the feeling of inside roominess.

Interior trim is a bit on the dowdy side. Cushioning in the seats and backs is meager. The rubber floor mats in front have a tendency to bunch up under your feet and they don't cover the rather bulky transmission hump. Kindest comment on the outside paint job: mediocre.

On the plus side: beautifully finished aluminum hardware, courtesy light in the roof that lights when either door is opened, three ash trays, and a couple of ingenious coat hangers in back. The divided backs of the front seat are individually adjustable for seating posture. Workmanship in fitting the windows and body panels is good.

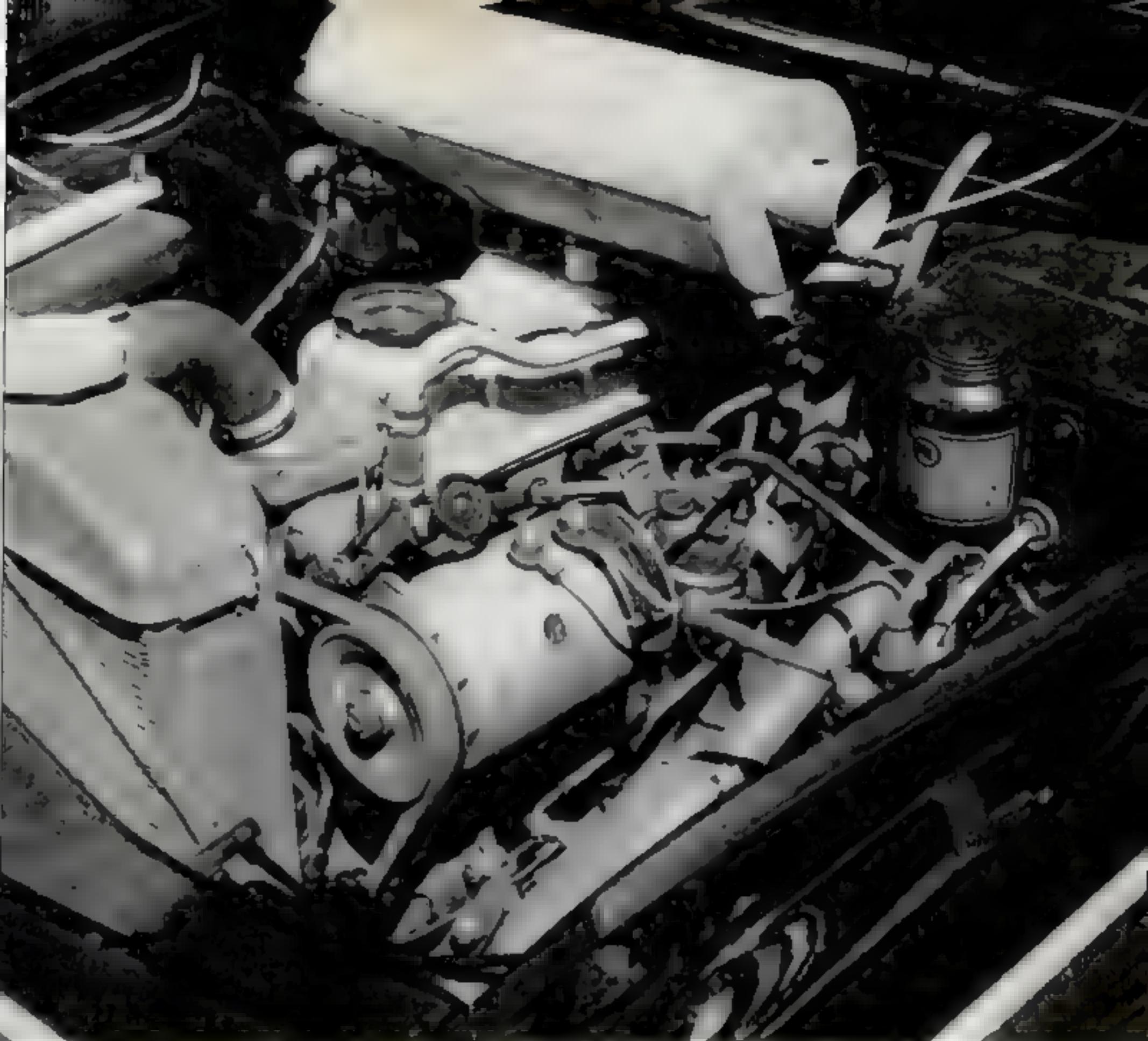
Engine block, head, pan, and transmission housing are all made of aluminum alloy. The chassis is built around a single tubular backbone that forks toward the front to form a cradle for the engine. Road clearance is $8\frac{1}{2}$ inches—one of the highest in the current crop of passenger cars, foreign or domestic. Transverse springs with independent suspension are used on all wheels.

In addition to the 440, two other models will be imported: the 445, same as the 440 with the engine souped up five more horsepower; and the 450, a cloth-top, four-passenger sports car with a 50-horsepower engine.

The importer says he has stipulated some 35 minor modifications that will appear on all future deliveries—including slightly softer springing, better paint job, and improved interior finish.

Factory production on the Skoda is reported to be 200 units a day with output steadily increasing. At the price—and if the factory does a reasonably good job in delivering the requested changes—and if its country of origin doesn't handicap acceptance here—the car could offer stiff competition to the VW.—Hubert Luckett.

Price (New York port of entry including federal tax)	\$1,595
Wheelbase	91.5 in.
Length	160 in.
Tread	front, 47.6 in., rear, 49.2 in.
Width	63 in.
Height	56.3 in.
Ground clearance	8.5 in.
Weight	2,050 lb.
Performance	
Top speed	68 m.p.h.
Fuel consumption (commuter driving)	28.6 m.p.g.
Fuel consumption (open road)	35 m.p.g.
Engine specifications	
Engine	4-cylinder, OHV, water-cooled
Displacement	66.4 cu. in.
Horsepower	40 hp. at 4,200 r.p.m.
Torque	50.5 lb. ft. at 2,800 r.p.m.
Bore and stroke	2.68 in. by 2.95 in.
Compression ratio	7.1
Chassis and running gear	
Front suspension	4 forward speeds 2nd, 3rd & 4th, synchromesh
Rear axle	swinging half-axles, transverse springs, ratio, 4.78 1
Front axle	trapezoidal half-axles, transverse springs
Chassis	central tubular backbone
Tires	205-60-13
Steering	3 turns, lock to lock
Turning circle diameter	33 feet



Aluminum engine block and head has wet cylinder liners and valve-seat inserts of steel.



TRUNK SPACE is generous. A small boy has no business being here, but this picture is just to demonstrate the ample luggage capacity.



VISIBILITY to the rear is unusually good for a small foreign car. Safety-glass rear window is interchangeable with the windshield.

Long-range look at the Economy Run:

Yes, the New Cars Do Take More Gas



1958 version of the annual petrol-pinching contest confirms the gloomy belief that U.S. cars are growing thirstier. But whose fault is it?

THE Mobilgas Economy Run is a curious annual rite that, in the folklore of Detroit, is worth \$5,000,000 to the manufacturer whose cars chiefly win it. This value is supposed to derive from a wide-eyed public belief that the winning car has been largely weaned of a taste for fuel, and will run on virtually engineering alone. Such is the opinion, at least, of enthusiastic car-marketing men.

Public attitudes toward the Run seem less tidy. "Economy Run?" almost anyone may ask. "That's the one that half a dozen cars win, isn't it?" Another view is that it is a yearly ceremony calculated to suggest that the new cars are better than ever.

The skepticism comes from a general awareness that cars are increasingly hard to drive past the gas-station pumps. Hence the feat of driving a heavy, high-powered new car for several thousand hill-and-dale miles on an improbably small amount of gasoline becomes, to much of the public, a stunt bearing scant relation to reality.

This year's Economy Run will do little to dispel the dreamlike air. For the third year in a row the sweepstakes winner was

an Imperial—a 2½-ton, 345-hp. land yacht that glided from Los Angeles to Galveston while sipping fuel at the rate of 20.5821 miles per gallon. (Its victory was based on a score of 62.7188 ton-miles, this index being an abstraction defined as "the number of miles that a gallon of gasoline drives a ton of car.")

Cars of the Chrysler family—the Imperial, a Chrysler and a Plymouth—copped three out of the four class trophies; an Olds nosed out a De Soto for the fourth.

How meaningful are Economy Run rankings? An answer can be approached by first considering three preliminary questions:

- How can the high miles-per-gallon figures be made to jibe with the widespread impression that new cars swill down gas?

- Is there a mathematical flaw in a contest formula that repeatedly gives the top award to heavyweight cars?

- What does an analysis of the Economy Run figures reveal about the gas-drinking habits of American cars over the last two decades?

Exotic driving techniques. An Economy Run driver practices an art form that is subtle, demanding and exceedingly



SWEEPSTAKES-WINNING IMPERIAL at left (20.5821 m.p.g.) and second-running Chrysler New Yorker (21.0217 m.p.g.) cross finish line in Galveston, Tex., bonnet-to-bonnet.

THIRD DAY LUBBOCK

FOURTH DAY DALLAS

ROUTE OF THE RUN: It wiggled across 1,883 miles of California, Arizona, New Mexico and Texas, from 22 feet below sea level to 7,540 above.

GALVESTON

TAKING TROPHY IN ITS CLASS, this Plymouth nosed out twin car of thrifty woman driver.



remote from ordinary around-town chauffeuring. His accelerator is of course never opened to that jet-spraying, yawning-barreled point where the engine roars with all its big-displacement majesty. But it's not just that a driver stays on the lean side of part throttle, outguesses every possible red light, and avoids the brake like the plague—though these steps are basic. He is also versed in tiny, cumulatively important tricks:

He keeps the windows up: less air drag. He keeps the radio antenna retracted: same reason. He uses matches instead of



OLDS 88 ENTERS WINNERS' CIRCLE, scoring top ton-mileage figure for Low-Medium Price Class, balking clean sweep by Chrysler Corp. cars.



DON'T WASTE A DROP: A driver puts ear to tank inlet to make sure gas won't get too close to top and overflow. A few wasted thimbfuls could spoil his chance to win a trophy.

the electric lighter: the generator would spend a spoonful of power in putting the watts back into the system. He keeps the radio and heater fan off: same reason. He even calculates about the windshield wipers: he uses them as little as possible if they are electric. But if they're vacuum, he runs them as much as his official observer will permit: vacuum wipers lean the mixture very slightly by admitting air to the intake manifold.

His car is freshly tuned to a knife edge and fitted, as rules permit, with a carburetor metering rod or jet one step leaner than normal. The axle ratio is the most favorable the rules allow; the automatic transmission is set for the quickest permissible upshift within the range of normal limits. Wheels are aligned meticulously. Brakes, drive train, and the wheel bearings have no trace of abnormal friction. True, the cars are inspected to make sure they are not unfairly prepared. But the system does not—and cannot—insure that they resemble the random, casually adjusted cars that we drive.

There is, then, no mystery about the Run's high gasoline mileages. Almost anybody could at least approach these figures—if he drove a beautifully prepared car in a bizarre, demanding and inconvenient fashion.

Are the rules right? Much tugging and hauling over the rules has attended the 15 Economy Runs held since 1936. Lightweight cars like Rambler 6, Willys and Henry J were permitted for a time and

then excluded. Overdrive transmissions were permitted and excluded. The rules at present are intended to let in only the cars the public mainly buys: five- or six-passenger sedans or hardtops, with engines exceeding 220 cubic inches, with automatic transmissions, and with (on eight-cylinder models) mandatory power steering and power brakes.

The ton-mile formula is supposed to permit fair comparisons between light and heavy cars. It has been attacked from several directions. Nontechnical critics argue that *any* handicapping is unrealistic, miles-per-gallon being the exact measure of a car's fuel economy. Why penalize medium and lightweights, they inquire, just because the heavyweights are fat with extra metal? Engineering-minded critics see flaws in the correction formula, and argue that a scientifically accurate compensation should include frontal area and other factors.

Engineers of the oil company that stages the Run concede that the ton-miles formula is inexact, and does overcorrect in favor of fat cars. (No car in the economical "Special" class ever won the Sweepstakes, and only one in the low-priced, relatively lightweight group.) The old formula stays on each year, though—it's convenient, not outstandingly unfair, and easily understood.

Are new cars really thirstier? On the basis of 15 Economy Runs, the answer is a clear "Yes." Analysis of the scores posted in past years shows the following:

- Average miles-per-gallon of all cars making the run varied very little from 1936 to 1955, hovering close to 21.8 m.p.g.
- Since then, fuel mileage has gone down startlingly. Average mileage fell 2.1 m.p.g. (10 percent) in 1956. It was also down in 1957, though not as much: 1.3 m.p.g., or six percent below the 20-year average. This year it sagged down to an embarrassing 18.7529 m.p.g.—almost 14 percent below the 20-year average.

To put it another way: Economy Run data indicate that for two decades the U. S. car traded advances in compression, engine design, and fuel for better performance and a larger package *while holding even on fuel consumption*. Then, in the last three years, the averages have nose-dived.

In partial defense of Detroit iron, some limitations on the meaningfulness

HOW THEY RAN IN 1958

(Cars Listed in Order of Standing)

LOW PRICE CLASS	Driver	Ton-Miles per Gallon	Miles per Gallon	Hp.	Cu. In. Disp.	Comp. Ratio
PLYMOUTH BELVEDERE	Pierce Venable	48.3264	20.0088	225	318	9:1
PLYMOUTH BELVEDERE	Mary Davis	48.1801	19.9897	225	318	9:1
CHEVROLET DELRAY 6	Gus Retzlaff	47.0738	20.6441	145	295	8.25:1
FORD FAIRLANE	Marshall Martin	46.8827	19.7775	205	292	9:1:1
FORD CUSTOM 6	Ivan Lewis	46.2543	20.8870	145	223	8.6:1
CHEVROLET BEL AIR	John Hartman	44.3255	18.7284	230	283	9:5:1
CHEVROLET IMPALA	Dorothy Retzlaff	41.2717	17.1787	250	348	9:5:1
LOW-MEDIUM PRICE CLASS						
OLDSMOBILE 88	Link Paola	50.5951	19.2377	265	371	10:1
DE SOTO FIREDOME	Myra Buchanan	49.2339	18.9471	295	361	10:1
EDSEL PACER	Don Rice	48.9044	19.2518	303	361	10.5:1
PONTIAC SUPER CHIEF	Lynn Paulette	48.3955	18.8017	270	370	10:1
EDSEL PACER	Loretta Colange	48.2209	19.0052	303	361	10.5:1
MERCURY MONTCLAIR	Fran Hernandez	48.1613	18.1621	330	383	10:1
BUICK SPECIAL	Joe Hill	45.7969	16.9445	250	364	9.5:1
DODGE CUSTOM ROYAL 500	Bob Donkin	44.2404	17.8137	305	361	10:1
DODGE CUSTOM ROYAL 500	Joan Fischai	43.4382	17.5490	305	361	10:1
STUDEBAKER PRESIDENT	Pete Novotny	43.3224	19.2608	225	289	8.3:1
HIGH-MEDIUM PRICE CLASS						
CHRYSLER NEW YORKER	George Alsbury	50.4928	21.0217	345	392	10:1
DE SOTO FIREFLITE	Hart Fullerton	51.9198	19.6573	305	361	10:1
MERCURY TURNPIKE CRUISER	Bill Stroppe	51.0536	18.8390	330	383	10.5:1
MERCURY PARK LANE	Verne Houle	48.4367	17.4186	360	430	10:1
OLDSMOBILE 98	Ray Brock	48.2714	17.4849	305	371	10:1
BUICK CENTURY	R. M. Flanagan	47.9027	17.6698	300	364	10:1
EDSEL CITATION	Art Rene	47.1114	17.2474	345	410	10.5:1
DE SOTO FIREFLITE	Ruth Doushkes	47.0751	18.2869	305	361	10:1
HIGH PRICE CLASS						
*IMPERIAL CROWN	Mal Alsbury Jr.	62.7188	20.5821	345	392	10:1
CONTINENTAL	Danny Eames	55.8884	18.0737	375	430	10.5:1
CONTINENTAL	Nicky Griffen	55.3927	17.9620	375	430	10.5:1
BUICK ROADMASTER	Don Bridges	50.3234	17.4024	300	364	10:1

*Sweepstakes Champion

Average ton-miles per gallon, all cars, 48.8693

Average ton-miles per gallon, men drivers, 49.2908

Average ton-miles per gallon, women drivers, 47.5447

Average miles per gallon, all cars, 18.7529

Average miles per gallon, men drivers, 18.8598

Average miles per gallon, women drivers, 18.4171

of Economy Run comparisons should be noted. One is the nature of the Run itself: Different cars are driven by different people over different routes in different kinds of weather. (The routes are believed to vary up to five percent in difficulty. And weather can matter; this year's poor average showing is attributed by some to persistent headwinds on one day's run.) Some if not all of these variables are corrected for, nevertheless, in a comparison of the average mileage of all cars.

A second partial explanation of the worsening fuel mileage undoubtedly comes from the exclusion, after 1955, of overdrive transmissions in favor of automatics. In the years that the two boxes

competed, overdrive consistently won. Several times identical cars differing only in transmission showed a four m.p.g. advantage for overdrive.

But the general public prefers the easy comfort of an automatic transmission to the frugality of overdrive. It also prefers—or has until lately—steadily bigger and heavier cars, power-parasitic accessories, and engines big enough to deliver neck-bending acceleration. (Times required to accelerate from zero to 60 m.p.h. have been nearly halved since 1950.) So if, as Economy Run figures indicate, the U.S. car is threatening to become a compulsive drinker, the U.S. buying public must shoulder at least part of the blame. END

Army hot-weather research reveals: New Ideas on Keeping Cool

Desert experiments show how to make the most of your body's marvelous built-in thermostat

By Philip Gustafson

ARMY scientists, seeking new ways to extend the fighting potential of soldiers campaigning in hot climates, are showing all of us new ways to beat the heat. Their findings have begun to shoot holes in many old-fashioned hot-weather maxims.

Extensive experiments on human acclimatization to heat were conducted recently by Quartermaster Corps scientists and experts at the Boston University School of Medicine. They found that distressing responses to exertion in hot weather—high temperature, fast pulse rates, dizziness and nausea—can be dramatically reduced.

What does the trick is an almost magical process of acclimatization to heat, inherent in the human body but capable of being speeded or slowed by a person's behavior. Here are some basic findings about this human mechanism:

- Acclimatization normally begins on

the first day of a heat wave, progresses to full development by the fourth day.

- It can be helped by short, brisk exercise periods in heat, or lighter but longer work periods. (Even if you do almost no work, you acclimatize a little.)
- If you are in good physical condition you acclimatize most rapidly.
- Over-strenuous exertion at the first exposure is bad; it may cause disability for several days.
- Failure to take in enough water and salt may prevent acclimatization.
- Once achieved, acclimatization to heat is retained for about two weeks. It can be extended by regular workouts in the heat at two-week intervals.

To acclimatize yourself, especially if you work outdoors, here's what Army scientists advise:

Thoroughly condition yourself by repeated (but judicious) activity in the heat over a period of from three to five days. This is even more important if you spend much of your time in air-conditioned surroundings.

For the trained athlete, the activity period can run up to two hours of strenuous exercise. For the rest of us, it tapers down to much less. How much? Each individ-

Hot-Weather "Do's"

At the start of a heat wave, restrict your work to a minimum. Everyone must find his own tolerance. When to quit? Take your pulse. If it's over 140, it's time to knock off for the day.

On succeeding days, condition yourself to the heat with moderate exercise.

Stop at nature's danger signals. If you feel dizzy or nauseated, knock off. These are the first danger signs. Ignore them and nature has another—and still less pleasant—device. You'll faint.

Keep in good physical condition. This increases your ability to get along in the heat. But it doesn't excuse you from a regimen of acclimatization.

Keep out of the sun as much as possible. Wear lightweight, light-colored, permeable clothing. Loose-weave, thickly woven materials are also cool even if they're dark.

Keep your weight down. The fat man is at a disadvantage in the heat. He has a smaller surface area for sweating per unit mass of heat-producing tissue, and more insulation (subcutaneous fat) to bar heat transfer to the surface.

Use anti-sunburn lotions. Those containing quinine absorb ultraviolet rays and do a fair job of preventing sunburn.

Wear thick-soled shoes as insulation against pavement heat. In extreme heat, take cold-water foot baths.



GOING NO PLACE on a motor-driven treadmill that keeps him trudging at a controlled rate,

this test subject in the Yuma desert is wired with thermocouples that report body data.

Hot-Weather "Don'ts"

Don't drink too much water too rapidly when you've been sweating profusely. When you sweat, you lose both salt and water. Sweat a lot without drinking water and your blood has too much salt in proportion. Drink too rapidly and you get too much water in proportion. This may lead to water intoxication—too much dilution in all body cells, including the brain cells. Convulsions can result.

Don't gulp a lot of salt tablets after excessive perspiration. Salt irritates the lining of your gastrointestinal tract. Instead, mix yourself a glass of salt water, or salt your food liberally.

Don't depend on cold drinks to keep you

cool. A cold drink absorbs some heat in the stomach but you can't drink enough to reduce the body temperature appreciably. But cold drinks do constrict the blood vessels in the skin. Thus you get a drop in the skin temperature which may make you feel cooler.

Don't wear belts and ties in hot weather. They cut off air circulation under the clothing.

Don't give way to the temptation of acquiring a Hollywood tan. Just being in the sun has the same effect on your body as a five-to 10-degree rise in the mercury. Suntan doesn't increase your ability to work in the sun. It merely keeps you from burning further.

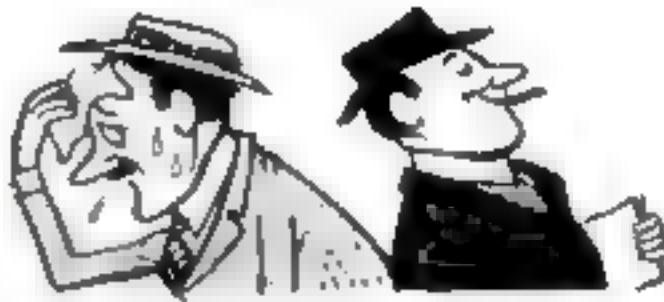
Common Hot-Weather Fallacies . . .



That you're asking for a sunstroke if you go out in the hot sun without a hat. Actually you're usually as well off without a hat: air can reach your skin, cool by evaporation.



That you should eat only salads and other light foods. The requirements for nutrition on a hot day are the same as at any other time. But when you eat a heavy meal, more blood is needed in the viscera. This adds to the load of the cardiovascular system. So if you eat heavily, you may feel warmer for a while.



That thin, light clothes are always cooler and you should keep away from dark colors. Army experiments confirm that black is warmer than white; it absorbs more of the sun's rays, while white reflects. This is true of thinner, lighter material close to the skin. But thick, loosely woven dark clothing may be cooler than thin, light, but tightly woven clothing. Loose, dark clothing absorbs the sun's rays farther from the skin, while its permeable texture admits air.

That alcohol in itself makes you hot. All it does is supply calories which you burn instead of food.



That more vitamins are necessary. In desert experiments, there was no evidence of increased vitamin requirements.

ual must find out for himself. But there is one foolproof way of knowing when you've had enough. Count your pulse. When it goes up over 140 per minute, knock off

Your body is stressed by two things in hot weather: the heat load imposed on it by the environment, and the heat load added to that by exercise. The doctors found dramatic body responses to temperatures in the Arizona desert that prove this point.

They checked pulse rates as high as 186 in men who walked for the first time at four miles an hour in 120-degree F. weather. That same walk at 77 degrees resulted in pulse rates of 115 to 120.

A man's ability to work is radically reduced by the heat load of 100 degrees. A 150-pound man can walk at three miles an hour without a pack for two hours a day and stay within the limits of endurance. If he steps up the pace to four miles an hour, he courts danger. At six miles an hour, only fit men can last six minutes.

Here is how you adjust to heat, even if you never go west of the Mississippi or swelter out anything worse than a Yankee hot spell. The body mechanism is beautifully equipped to deal with hot weather, even in temperatures up to 120 degrees—if you don't exercise too much. Its main

[Continued on page 214]

1015
Popular Science
Editor Howard
Allaway, right,
receives gold medal
from Daniel D.
Mich, Editorial
Director of Look
magazine, last
year's winner.



Popular Science Wins Year's Top Magazine Award for Public Service

The year's most prized award for magazine editorial achievement, the annual Benjamin Franklin Award for public service, was presented last month to POPULAR SCIENCE.

POPULAR SCIENCE was designated for this honor for its publication of a series of articles, "Straight Talk to Parents," which appeared in the magazine from March through December last year. The articles counseled parents on how to direct their youngsters toward educational opportunities leading to profitable and useful careers, particularly in scientific and technical fields.

POPULAR SCIENCE, the judges commented, ". . . presented one of America's greatest problems in a sharply focussed series of articles directed to the group who will have to do the most about it—the American parents. . . . As opposed to generalities on educational theory, these articles provided real tools with which to handle the here and now . . ."

Besides a gold medal and scroll, presented to Editor Howard Allaway, certificates were awarded to the authors of the individual articles: Senior Editor Martin Mann, who also coordinated the entire series; West Coast Editor Wesley S. Griswold; Associate Editor Erik H. Arctander; and free-lance writers David Lindsay, Vance Packard and John Kord Lagemann.

Previous winners of the public service award, which is administered by the University of Illinois, were *Ladies Home Journal*, *Redbook*, *Woman's Home Companion*, and *Look*.

The Benjamin Franklin Award is the third major magazine prize won by POPULAR SCIENCE during the past year. Others were a "Maggie" Award, made by the Pacific Coast Independent Magazine Wholesalers Association, for the "Popular Science Reference Library" series of tear out booklets, as demonstrating "the most original creative spirit" during the year in the magazine publishing field; and the annual National Safety Council public-interest award, which PS has won eight years in a row, for articles promoting highway safety.

How To Help
Your Youngster
Choose a Career

HOW DANGEROUS ARE THOSE SMALL?

By Martin Mann

THREE'S this little Volkswagen stopped for a red light. Up comes a big Buick, too fast. It slams the VW in the left rear at 35 m.p.h. The little car takes off on a 72-foot slide diagonally across the road into the grass.

Damage to the VW: cracked block (it's a rear engine, remember) and driver's seat torn loose. The driver walks away.

Then there's another little Volkswagen in San Francisco. It crashes head-on into an old Caddy, gets squashed from the rear by a third car.

This VW ends up a smashed tin can. Two wreckers work an hour pulling pieces apart to get at the driver's body. In the American cars—one driver is not hurt at all; the other is injured slightly.

Those two accidents, which actually happened, are what many Americans worry about when they consider buying a small foreign car.

Which case is typical? Will you walk away or get mangled? Does the import's small size and light weight make it a special hazard on the highway?

The U.S. public last year bought 200,000 European bugs. This year one out of every 16 new cars will be stamped Made in Germany or Sweden or England or France or Italy. Sooner or later there'll be many more small cars, aside from the Rambler, stamped Made in USA.

Are they safe?

Now, for the first time, there is an answer. Not a solid, 100-percent-guaranteed verdict. But a dispassionate, scientifically based appraisal that shows pretty clearly which way the decision will go.

POPULAR SCIENCE asked Cornell University's Automotive Crash Injury Research group to take a hard look at small-car safety for you. ACIR is one of the country's main accident-research centers. With government-industry support, it collects and analyzes crash reports from 16 cooperating states. Its findings, persuasively evangelized by Director John O. Moore, helped put Detroit on the safety kick several years back—seat belts, padding, positive door locks.

Fast-talking, energetic Boris Tourin, supervisor of ACIR's Technical Department, says, based on what he prefers to call a "preliminary survey":

- Small size and light weight are *theoretically* a hazard. The little cars are mice lost in a herd of elephants.
- But other factors compensate. In certain accidents, small cars come through better. In others, big cars are better.
- The overall picture shows big cars very slightly—but not positively—safer.

How can you tell? There are at least four ways to gauge the safety of a car.

1. Look at its construction and design in the light of elementary laws of physics.
2. Drive it.
3. Crash-test it.
4. Analyze the results of actual accidents.

POPULAR SCIENCE and the Cornell group applied gauges 1, 2 and 4 to small cars. Nobody, so far as PS can discover, has used gauge 3; crash tests are very expensive.

The car. It's small, it's light, and it's lean. Those attributes, beloved by owners, affect safety in these ways:

- Common sense, reinforced by Sir



Isaac Newton, tells you that a light object gets the worst of a collision with a heavy object. Energy works the harm. The heavy object has more energy, which it expends by crumpling the light object.

• The small passenger compartment offers less room for you to flail around in. Your head is always close to something to bump into.

• Among the frills omitted are safety frills. Safety door locks, seat belts and crash padding, which are either standard equipment or readily available options on the Detroit product, are not so easy to come by in foreign makes. Saab has both the locks and a "collapsible" dash. The Renault has a padded "collapsible" dash, while Peugeot puts some foam rubber on the dash. Belts are offered by Renault, Peugeot and VW.

Add it up and you have apparently indicted the small car as a poor risk. But it's a theoretical indictment. What happens in practice is something different.

The driving. How does it feel to be a mouse among elephants? POPULAR SCIENCE editors have been check-driving small cars for years. I tried them, too.

I took a couple of bugs into the New York area's worst traffic, which is plenty bad: Fruehauf-loaded turnpikes; long, narrow under-Hudson tunnels; Cadillac-and-taxi-choked city streets; suburban blacktop on a Saturday afternoon. Here's what it's like.

Looking out the windshield, you can't tell you're a mouse among elephants. Bigger cars do not overwhelm you. Terrifying tunnels, with trucks that always seem about to fall over on you, are no sweat after all.

It's the rear view in the mirror that shocks you. All you can see of a following Caddy—even 10 car lengths to the rear—is bumper and dagmar. You're a mouse!

There are petty nags at your safety conscience, as well. The clutch and brake pedals are too small and too close together. The splash from passing cars on a rainy day inundates you so heavily you need a periscope. Yet you climb up from behind the wheel with the standard opinion: This is a pleasant and practical car, fun to drive and safe to drive.

The accidents. You can theorize about safety all you want to from design studies and driving tests. What really counts is performance on the road—the accidents a car does or does not get into, the harm caused to its occupants.

One crucial point—is the small car accident-prone?—stands unsettled now and will remain so for years to come. Not until many more crashes have been recorded and analyzed can the experts tell whether small-car crashes are disproportionately frequent or infrequent, whether you stand more or less chance of getting involved in a smashup simply because you ride a small car.

Two other questions—both important—can be answered, even if only tentatively:

1. What kinds of accidents do small cars get into?
2. What happens to the people inside?

You need both answers, together, because some accidents are very common (crumpled fenders) but not very dangerous, while others are very dangerous (trucks toppling on cars) but not very common. It's the combination of exposure

Accident figures show small cars are more likely to overturn



ROLLOVER after glancing off a tree (driver fell asleep doing 50) left a VW like this. The driver was pinned inside, cut and bruised.



TREE did this to a Hillman that swerved to avoid a dog in the road, went out of control at 40 m.p.h. The tree, 10 inches thick, split.



WINDSHIELD POPPED OUT WHOLE in the Hillman-tree accident, protecting driver and passenger. They were injured, but not seriously.

and risk of injury that tells the story.

Answering such questions is the specialty of Tourin and his group at ACIR. From their detailed accident reports—four-page police forms, photos, medical records—they and their IBM machine have settled arguments like: Is speed the sole killer? (no) and: Are new cars safer? (yes). They gave their fancy statistical treatment to small-car accidents. The classification was based on weight, which means that a few Detroit jobs (Henry J's and old, old Studies) were sprinkled in with the bulk of VWs, Renaults, Anglias, and the rest. Here is what they found:

Kinds of accidents. The pattern is clear—and surprising. Small cars tend, not to get run over by the big ones, but to roll over by themselves.

Collisions are still the most common type of accident, for little cars (2,500 lb. and less) as well as for the big ones (3,000 lb. and more). But the proportions are strikingly different. Of all accidents involving light cars, roughly 60 percent are collisions, 40 percent are rollovers. For heavy cars, the split is 80-20. So if you have an accident with a light car, it's twice as likely to be a rollover.

This does not mean that the light cars get hit and then roll. They go off the road, out of control, and roll—all alone. Case K30061 is typical.

A '57 Renault was burning up U.S. 6 at 60 m.p.h. early one wet morning last July. The driver veered onto the soft shoulder and lost it. The Renault skidded back across the lane to the dividing island—soft dirt. It flipped onto its side, then skidded that way across the island and the opposing lane to the far shoulder.

The car was badly banged up, but the doors did not open. The driver was unhurt.

Why do they roll? Your guess is as good as anybody's. It could be the fast steering ratio, light weight, or small wheels. Maybe the center of gravity is higher than it looks (tread is narrow, wheelbase short). Whatever the cause, rollovers—even end-over-end—are a distinctive trait of small-car accidents.

The injuries. That's the next question. If you crash, would you come through better or worse in a small car?

Again the Cornell group matched ac-

[Continued on page 210]



If the Highway Builders Want Your Home

Thousands of homes are being seized to make way for new roads. If yours is on the list, should you accept the inevitable—or fight?

By Edward D. Fales Jr.

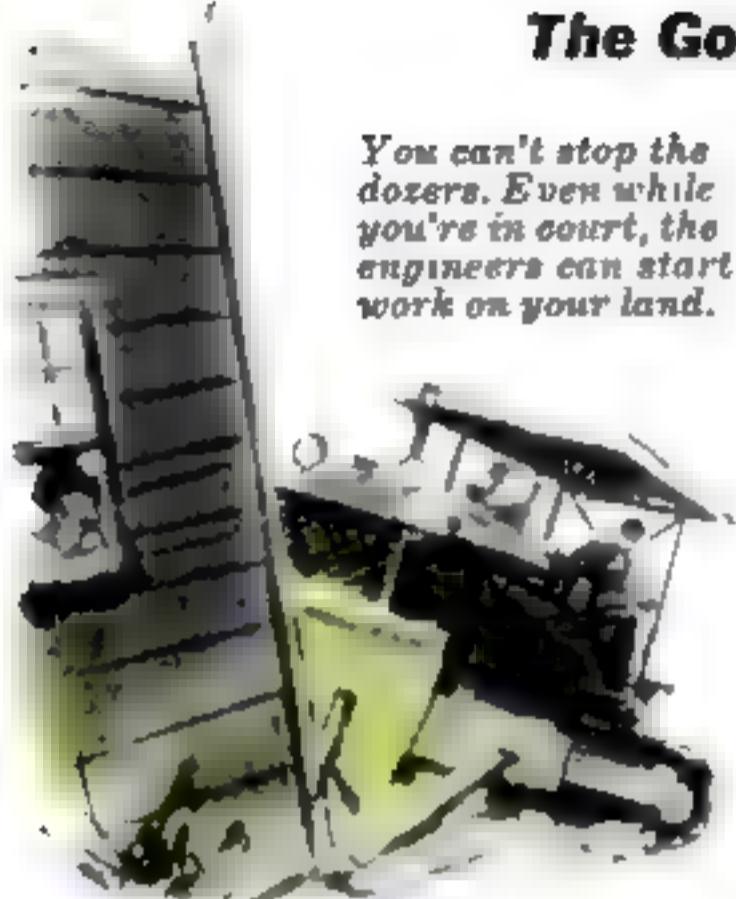
- To build 129 miles of turnpike, Connecticut recently seized 2,550 homes.
- To build a projected 41,000 miles of U. S. super-roads, 700,000 parcels of land must be taken.
- Two million pieces of land, many with houses on them, will be needed for roads in the next 14 years.

YOUR doorbell rings. Two men you never saw before are there. "We have been sent," one says, "to appraise your home."

"My home?" you repeat, unbelievingly. "That's right." And then they explain, in as friendly a way as they can, that a new road—or school or airport—is going to be built where you live. Some of your land is needed, possibly all. And your

The Government does everything it can to

You can't stop the dozers. Even while you're in court, the engineers can start work on your land.



house must be torn down or moved away.

You gulp and try to think. This must be a joke. You've worked, and saved, and planted . . . But it isn't a joke.

And sure enough, in six months perhaps, your home is only a memory.

Practically unnoticed, this sort of thing has been happening to thousands of U. S. families. Those new turnpikes you use so comfortably and safely were built on land taken from your neighbors. Property "quick-taking" is under way on a scale never before known. It's the price we're paying for population growth, and progress.

You may say: "Oh, but it could never happen to me." That's what thousands thought who recently have seen bulldozers rip their homes apart.

"But this is America," you say. "No one can take my home if I don't want to sell. I'll get a lawyer. I won't budge."

A lot of home owners have felt that way. But only two or three in 100 keep fighting when the final showdown comes. That's because the engineers, appraisers and project officials generally do everything they can to give you a fair break. They're not trying to be altruistic; they've got to keep your good will in order to succeed with future projects.

Let's look at specifics. Let's suppose you own a house that cost you \$12,500 six years ago, worth maybe \$17,500 today.

One day an engineer draws a pencil line on a map. The line represents a new road that will connect two superhighways 50 miles apart. The line represents months

of careful location study. Putting the road anywhere else would double the cost and also result in dangerous curves. As drawn, the line runs right through your property.

Who owns the land? How can public officials doom your property without even consulting you? Few of us know it, but none of us have absolute control over our own property. This principle of law goes back many centuries. We hold land subject always to public welfare.

Today when whole cities are turning inside out (and other cities are springing up on lonely farm land) space must be found in a hurry, not only for roads but for new schools, parking lots, housing projects, flood control, power lines, airports, missile sites.

To cope with the problem, legislatures have given dozens of government agencies—national, state, county and city—absolute power to take land by condemnation.

There are only two requirements: (1) the public must actually need your property, and (2) it must pay you a fair market price. Utility companies are authorized by law to take land on the same basis.

Do you have any say about this "public necessity"? Theoretically, yes. Actually, in many states, no. Often you can demand a public hearing—if you find out that a project is coming your way. That's a big "if." Engineers often work in deep secrecy, for two reasons:

- To keep the public from getting worked up over a project, especially when the final location has not been decided.

- To head off land speculators who gobble up land and prepare hasty "plans" for "developing" it, in hopes of holding up the state for a big bite of the taxpayers' money.

Hearings are always held on federal-aid highway projects that affect city areas. But on many other projects no public hearing is held, even if you demand one. This is a bit of high-handedness that planning agencies now are getting away from, however, and you'll see more hearings in the future.

How do you find out? Unless your town has a live-wire newspaper, you may never know your land is to be taken until the appraisers arrive. Wisconsin

give you a fair shake—but you won't get rich

sends out a "nice three-page letter," but most states and cities remain mum. One tip-off: You may see surveyors around. This is not a sure-fire clue. It is just barely possible they could be decoys, sent to mislead speculators (who are a tremendous headache to conscientious public officials). Or they may be working on another job entirely.

Who are the appraisers who come to your home? Usually at least one is a local real-estate expert. Their orders are to appraise your property as if it were their own, to be fair, and to remain mum. "How much is my place worth?" you may ask them. "Sorry, can't talk," they say, and go away, taking their notes.

How fair are they? Most people find them quite fair. Appraisals are based on careful formulas.

What happens next? In a few states you get a court notice and a price offer by mail. But in most states a negotiator calls in a few days. He is a friendly chap, hired for personality, fairness and business sense. He may tell you that, based on the appraisal, he can pay you \$16,500. If you can prove that the appraisers overlooked some items, you may end up, after some dickering, with around \$17,500. (In some states negotiators do a little horse-trading with you. But this is now forbidden on federal-aid projects.)

Can you have a lawyer? Yes, and if you have any real reason to doubt that procedures in your area are fair, you should have one. A lawyer may remind you of things you might not have thought of: those two trees you planted, or the lawn you carefully sodded.

U. S. roads experts say, however, that in many states, where condemnation procedures are run on a very high plane, where they bend over backward to be fair, you may gain nothing by having a lawyer to represent you on highway-condemnation projects.

In any event, you don't have to agree to the state's offer at once. Some negotiators call three or four times. You have time to think and get receipts showing improvements you've made.

But within two or three weeks you must decide: Will you take the offer, or will you be one of the few who reject it?

If you accept, you sign an agreement, get a check for the whole amount within 30 to 60 days, and also get a deadline for moving. This may be from 60 days to two years. If you stay very long you rent your house from the agency that's bought it.

Suppose you refuse. The state files condemnation proceedings. You'll be summoned to court to tell your side—and now you definitely do need a lawyer. The court names an impartial board of review, or a referee who may be a retired judge or a real-estate expert. The referee, or board, now studies your case and recommends a price to the court.

But what if you're still unsatisfied? You go to trial—either with or without a jury, as you wish. Now you're at the end of the trail. The jury's finding is final. It may be more money—or it may be less than the state offered you. And if it is, you're stuck with it.

How often do property owners win? Generally about half of the time. If you win, some states will pay court costs and even part of your lawyer's fee. But if you lose you may pay, and these costs

You won't be reimbursed for inconvenience, sentimental attachment to your property, or noise.



You may be able to take your home with you. But house-moving is costly, often it doesn't pay.



run from \$200 to \$2,500. A few states pay your costs, win or lose.

Suppose only part of your property is needed? Then you are paid: (1) for the part actually seized, plus (2) damages for loss of value on the remaining part.

But there are several things to remember. You are never reimbursed for inconvenience, sentimental attachment to your property, or noise.

You can't stop the bulldozers—even if you go to court! In fact, the engineers can start pushing dirt around on your place even while your case is being heard. As a matter of good judgment, however, they usually make every effort to avoid doing this.

Under our laws, the project engineers can apply to the courts for an order of immediate possession while you are appealing. This is invariably granted. Meanwhile the state must post with the court a check for the full amount of its offer to you. You can claim this at any time during the appeal without hurting your chances of getting more. (But if a jury should cut your award you'd have to give some of it back.)

What happens to your mortgage? Usually the state pays it off—and any loans or back taxes—then pays you the balance of your award.

Suppose you had a GI loan? Usually you can get a new GI loan to buy another house.

Do you have to pay federal income tax on the money you receive? Not if you reinvest the full amount in another house,

within 18 months. (Check your district Internal Revenue Collector for details on this.) Otherwise you must pay capital-gains tax on your theoretical profit—the difference between what you paid for your house and what the state paid you for it.

Can you make money on the deal when a government agency takes your property? It's virtually impossible. Appraisers are shrewd, and the courts are learning the tricks of speculators.

You may come out quite well in the immediate settlement. For one thing, you'll save the real-estate agent's fee you would probably have to pay if you were selling your house voluntarily. But remember, you still have to move and get settled, and none of these expenses is paid. Owners whose homes have been condemned say you may end up even, if you're lucky, or perhaps from \$500 to \$2,500 out of pocket, depending on how many adjustments you must make to get your new home as comfortable as the old one. Balancing this, you may end up in a newer or slightly better house.

If you buy a new house that's a little better or newer, of course, you may find yourself taking a new mortgage. One young couple recently got \$14,000 for their house, took on a \$4,000 mortgage and moved into an \$18,000 house.

Can you take your house with you? If it is movable, this can often be arranged. Some states first buy your house, then put it up at auction. You can buy it back and move it. Example: You might be paid \$17,500, then buy your house back for \$7,500.

Don't expect to make money this way, though. House moving is expensive. By the time you buy a lot, dig a new foundation, pay the house mover, put in plumbing and landscaping, you should break about even.

Some states go to great lengths to help you; others don't—you're strictly on your own. But California, which has moved thousands of houses, has even developed new land, putting in water and sewer lines for the transplanted homes.

Will you get cheated? It's not very likely. Some older couples suffer tremendous mental distress when sentimental ties are shattered. But our public engineers honestly feel that—monetarily, at least—most awards are eminently fair. END



A Safety Tragedy Expressway Turnpikes and Hand Looks

**Have engineers made our turnpikes as safe as they can be?
Here's a report on their successes—and dangerous failures**

By Paul W. Kearney

*Author of *I Drive the Turnpikes—and Survive**

BILLIONS of vehicle miles are evidence that a modern turnpike is from 2½ to four times safer than an ordinary public highway. So, logically enough, these new roads have become the master pattern for the 41,000-mile network of super-roads now abuilding.

Despite their superlative safety records, turnpikes still have shocking crashes. Which gives rise to a pertinent question: Does turnpike experience suggest ways in which they can be made even safer?

The answer is a flat Yes.

The turnpike has already altered conventional accident patterns. On pike after pike today, the No. 1 accident cause is Driver Asleep. Closely allied with this fact is another: By far the commonest public criticism of toll roads is that they are monotonous. These two facts are inseparable—and they account for far more expressway troubles than that overworked bogey, Speed.

The following criticisms of toll-road design, it should be noted, are the observations of one who has racked up 85,000 miles on all existing pikes between Maine and Texas. Opinions have been liberally fortified by interviews with both state troopers and toll-road management officials—the men most acutely aware of the shortcomings that exist now.

In this light, here are six major indictments of modern turnpikes. They are worthy of the most careful study by those who are planning our new interstate network.

1 Faulty crossover protection

The narrow median strip, without an effective barrier, is the most universal and serious fault. Eighteen years ago, when the Pennsylvania Turnpike opened, its 10-foot center island was deemed adequate—indeed, we were still blithely building “motor parkways” with nothing but a paint stripe to separate opposing

"The narrow median strip, without an effective barrier,



CENTER STRIP 56 feet and wider separates opposing traffic lanes of the Ohio Turnpike. A deep ditch runs down the middle portion.

traffic. But a 10-foot grass patch became as impotent as a painted line for keeping oncoming drivers out of each other's lane. And by 1955 the Pennsylvania pike saw one-third of its fatal accidents, and 42 percent of its deaths, from head-on collisions after crossover.

The basic question is not why they crossed over, but why they were able to? Designers of later extensions on this pioneer pike not only perpetuated the blunder of the too-narrow median—they for-

sook even that, on the newest extension, in favor of a concrete curb that is too narrow and too low. For years cars have been mounting a higher barrier on some of the 40-m.p.h. Long Island parkways—where it was added as a lame second thought after gruesome experience.

Center islands that are too narrow, or completely unprotected, prevail on the Maine, Florida, Kansas and Oklahoma turnpikes. After all these years of experience, this seems inexplicable—especially when you drive along and note the number of fresh tire tracks where cars have gone clear across. The troopers on all of them confidentially admit that they have far too many crossovers.

Even the famous New Jersey Turnpike has only a 20-foot median. But it is now adding miles of steel barriers on stretches where experience has been bad. Both the Garden State Parkway in New Jersey and the Connecticut Turnpike have gone in heavily for medial guard rails, especially on curves and in congested areas where exceptionally high land costs restrict the width of the right of way.

Garden State has also moved in the other direction wherever possible with a center island ranging from 100 to 600 feet

Safety Audit: Turnpike Debits and Credits

Ohio Turnpike. Twin bridges are used on all overpasses, and on these bridges the pavement widens six feet. This is psychology applied in concrete: A bridge rail too close to the driving lane forces timid drivers onto the center stripe.

This is the only turnpike that gives printed information on available motels within 5½ miles of each interchange—a much-needed service for travelers.

Indiana Toll Road. Heating pipes in the concrete at toll booths keep these areas free from ice and snow.

West Virginia Turnpike. In contrast to the dungeon-like illumination of the seven tunnels on the Pennsylvania Turnpike, the light-

ing of the Memorial Tunnel on the West Virginia is superb. This is far more important on bright days, especially with snow on the ground, than at night. This tunnel is monitored by four TV cameras with viewing screens in police booths.

Oklahoma's Will Rogers Turnpike. Their answer to the moot question of center-island restaurants was to build a dramatic eating place at Vinita right across the traffic lanes. Escalators take patrons upstairs from entrances on either side of the pike.

(The Kansas and Florida turnpikes and the Garden State Parkway all favor the center-island service plaza at grade level, with cars entering and leaving via the fast lane. Florida and the Garden State have had no accidents from this dubious practice; Kansas has had a few minor ones involving cars entering the areas, but none on leaving.)

New Jersey Turnpike. Two early pioneering contributions of this "Queen of the Turnpikes" are its fine nonskid surface of asphaltic-concrete and its wide use of overhead directional signs on which the information is unmistakably clear. On fast roads there

is the most universal and serious turnpike fault"

in width. In addition, it uses "split-level" construction, with traffic lanes in one direction on a different elevation from opposite lanes. Indeed, on many parts of the Garden State you can't see the opposing traffic at all. The Ohio Turnpike and the New York Thruway have adopted this sound principle where the terrain permits.

Where conditions—or inertia—prevent wide separation, the Ohio and Indiana turnpikes offer a good alternative: the depressed medial strip. Although their dividing mall is a generous 56 to 100 feet wide, it is further safeguarded by being ditched in the center to a depth of three or four feet. This makes it very difficult for a car to cross over, gives drivers a comfortable feeling of security, aids drainage, and is a logical place to push snow in winter.

Several state highway departments have experimented with the Floribunda rosebush barrier which, in repeated tests, has effectively stopped cars at speeds up to 70 m.p.h. Cheaper and safer than the steel guard rail, its main drawback is that it takes three to five years to get the bushes into full growth. Trees do not make satisfactory safety barriers; they are killers in collisions.

should be no moment of doubt in making a decision.

Jersey innovations include flashing neon signs warning of Fog, Ice or Accident Ahead; a special fog lighting system; and horizontal yellow strips across the driving lanes approaching toll booths as an additional warning to slow down.

Garden State Parkway. This is the only expressway that has roadside telephone booths between service areas. These are so popular that the telephone company collected \$47,500 last year from 13 booths (of which the Parkway gets 20 percent). Twenty more are now being added.

A current experiment worth watching is the use of a deer repellent on trees along the right of way (it's impractical to build fences high enough to curb these champion jumpers). This is a problem in many states: The New York Thruway had over 600 deer accidents in one year with an average property damage of \$300 per car.

Florida Turnpike. Problems here include an occasional alligator dozing on the pavement, and buzzards whose slow takeoff has smashed

2 Inadequate right-hand shoulders

This is a mistake that the early Pennsylvania Turnpike commendably avoided, but which newer pikes thought up for themselves. On the greater part of the Pennsylvania pike you can not only pull a disabled car off on a paved shoulder, but there is ample room on the berm beyond to get well out of the way of passing traffic. This is a godsend to truckers and motorists alike. But newcomers to the pikes, as well as some of the designers, seldom appreciate this feature until they discover that no less than 10 percent of the fatal accidents on the busier toll roads involve one car standing still. This is five times the percentage of such accidents on public roads.

The relatively new Massachusetts Turnpike is an outstanding offender in this respect. Not only is a disabled car pinned to the shoulder by a low cable fence, but the shoulder is exactly the same color and material as the driving lanes. The only demarcation is a solid white stripe, and strangers commonly mistake the shoulder for a driving lane despite newly erected warning signs. Simi-

more than one windshield. To forestall the gathering of buzzards, troopers on this pike now carry trench shovels and are required to bury immediately the remains of any dead animal.

A debit that the Florida and Connecticut pikes share is speed-change lanes that are too short.

Connecticut Turnpike. The use of a yellow marginal stripe on the right side of the slow lane should be very effective when the shoulders are snow covered, as well as in rain or fog. The proven high visibility of yellow seems to have been ignored on virtually all other pikes, both for striping and for signs.

In contrast to Connecticut, the New York Thruway has been very parsimonious in its use of paint, there being no right-hand stripe of any color except on bridges and at speed-change lanes. This is inexcusable—the stripe is a necessity in bad weather or when fighting headlights. Florida's turnpike has made the same error.

Connecticut's answer to the headlight-glare problem is a superb example of highway lighting—the longest continuous stretch of expressway illumination ever installed.

Could These Ideas Waken Drowsy Drivers?



Sleeper horns. Every few miles in open country install in the center island a "foghorn" that would sound at frequent intervals. Emitting a deep bay—or perhaps a more musical note—the signal would impinge on the wandering minds of drivers within range and bring them back to earth.



Singing pavement. It has long been customary, on steep grades, to draw a stiff broom across the fresh concrete before it has set to roughen the surface for better traction. An incidental by-product is a marked change of tire tone when wheels strike this stretch. Doing this to a 100-foot strip of pavement at intervals of every 25 miles would provide a built-in "alerter" in the highway itself.



Car clock alarm. Perhaps a car clock could be made to sound an audible alarm—a brief but imperative note at a rather exciting pitch at intervals of about 15 to 20 minutes.



Emergency warning mats. It is difficult to slow or stop some fast-moving drivers once they get the bit in their teeth—they even run through lighted flares to ram into stalled vehicles. For temporary turnouts around disabled vehicles or maintenance jobs, some form of thin, steel chain mat might be designed that could be spread across the driving lanes about a mile ahead of the obstruction. This should be rugged enough to alert the driver to the situation, but not rough enough to scare him.

"A drowsy driver is at least

lar criticisms can be leveled at a number of other turnpikes.

3 Unwise no-stopping rules in the stretches

Many of the pikes have regulations against stopping, even off the pavement, for anything but emergencies. The New York Thruway posts No STOPPING EXCEPT FOR REPAIRS—which is carrying theory beyond realism on a road where it is 65 miles between some service areas.

The theory, of course, is that any car that stops on a high-speed road becomes a potential accident, which is correct. But in practice, sleepy drivers cause five times as many fatal accidents as cars standing still, or cars coming onto the road.

Last year, the Ohio Turnpike (which is posted No STOPPING EXCEPT FOR EMERGENCIES) took the intelligent step of decreeing that drowsiness is an emergency, and that sleepers who are well off the highway should not be disturbed by troopers. From the very beginning the Pennsylvania Turnpike has encouraged the drowsy driver to pull off and nap, and has provided ample space for him to do so safely. Indeed, its Dawn Patrol is alert for "weavers" and compels them to pull off and rest.

The Garden State Parkway also has numerous roadside resting places, pull-outs and picnic areas, and encourages drowsy drivers to use them. These are busy expressways, yet none has had any unfortunate experiences due to drivers coming back on the highway after a pause.

No practical number of turnout areas can take the place, however, of adequate parking space beyond the shoulder. A driver cannot schedule his sleepiness on a map. Hence the vital thing is not only to get him off the road before it is too late, but also to make it easy for him to do so. Sleeping in a car on the shoulder is a passive form of suicide.

4 Insufficient diverting barriers or guard rails

Collision with fixed obstructions still takes too many lives. Turnpikes have many overpasses—over 500 on the main New York Thruway alone, or better than

partly a product of shortcomings in highway design"

one per mile. This bridging of local traffic over the expressway is a major factor in the toll roads' unprecedented safety record. But it is also a source of grief.

The trouble is the drowsy driver who dozes off and smashes into a bridge abutment. This happened so often on Connecticut's Merritt Parkway that guard rails had to be installed to deflect cars away from the stubborn concrete. The New York Thruway did the same thing last year over its full length; the Kansas Turnpike has them on culverts and other fixed obstructions, but not on bridge piers — yet. Sooner or later this will be a standard protective feature on all high-speed roads.

The sleepy-driver problem has all the turnpike officials by the ears. Oklahoma's 70-m.p.h. Turner Turnpike is only 88 miles long. Yet out of a total of 25 fatal accidents in 55 months of operation, 12 were due to Driver Asleep—or four times the number due to Excessive Speed, second on the list. And of a total of 32 deaths, 15 were charged to sleeping.

The Ohio Turnpike has charged 50 percent of its fatalities to this cause. The West Virginia Turnpike has announced its intention to prosecute such offenders for "driving out of control." Troopers from the Garden State Parkway have gone into hospitals to serve summonses on drivers who fell asleep and were injured in the resulting accident. Coupled with this is the experience of the New Jersey, Pennsylvania and other pikes that as many as 50 percent of their smashups, even in broad daylight, are due to rear-end collisions, compared to less than eight percent for this type of accident on rural roads in general. One obvious factor is "highway hypnosis," which amounts to being asleep with your eyes open.

The pikes have a relatively high ratio of single-car accidents. On rural roads as a whole, the single-car mishap represents only about a third of the non-pedestrian accidents. But on the Oklahoma Turnpike it accounts for 67 percent; on the Ohio, 72 percent; on the Kansas, 77 percent. All of which is pretty hard to explain on superhighways devoid of the sharp curves, steep grades and other inherent physical hazards of most public roads.

5 The boredom that kills

The drowsy driver, or the "hypnotized" one, is at least partly a product of faulty highway design. And of the 15 turnpikes that I've driven, the only one to make an aggressive attack on the problem is the Garden State Parkway. The approach has been threefold. One feature is the "singing shoulder." This is a heavily corrugated strip of concrete, about a foot wide, marking the right-hand margin of the right-hand driving lane. If your wheels wander over on that strip, the resulting tire howl jerks you out of your doldrums. I saw three letters from motorists who say this device saved them when they dozed off. Lately the New Jersey Turnpike has adopted the same expedient at exit and access lanes.

The Parkway's second approach is "fluid contour"—purposely providing gentle curves to keep the driver driving all the time. The longest straight stretch is 3½ miles on the New Jersey Turnpike, two miles on the Indiana Toll Road, but there is no straightaway longer than one mile on the Garden State Parkway. In contrast, I clocked nine to 12 miles between curves on the Oklahoma and Kansas turnpikes.

The third thrust at boredom is an abundance of planting and landscaping. No less than \$5,000,000 was included in

[Continued on page 198]



SINGING SHOULDERS of the Garden State Parkway cause tires to howl if a drowsy driver wanders over onto the right-hand shoulder.

Twin Reactors to Drive World's Biggest Sub



HOW THEY COMPARE:

TRITON



POWER: TWIN NUCLEAR REACTORS LENGTH: OVER 400 FEET DISPLACEMENT: 5,450 TONS CREW COMPLEMENT: 110

NAUTILUS



POWER: SINGLE NUCLEAR REACTOR LENGTH: 319 FEET DISPLACEMENT: 2,900 TONS CREW COMPLEMENT: 101

ALBACORE



POWER: DIESEL-ELECTRIC LENGTH: 200 FEET DISPLACEMENT: 1,800 TONS CREW COMPLEMENT: 40

Bow as sharp as a destroyer's, Triton will be the first of a new class of high-speed attack subs to slide into the water

By Eliot Tozer

SOMETIME this summer a submarine named Triton will groan down the ways at Groton, Conn., and slide into the murky Thames River. She'll make a big splash in more ways than one. For Triton is the biggest, toughest and most powerful submarine ever built.

Early this spring, I was allowed to prowl through the yard of the Electric Boat Division of General Dynamics Corp. where three of the Navy's top-priority A-subs are being built. My guide, a hard-bitten New England shipbuilder, had greeted me coldly. "I'll show you Triton," he said, "but you'll look only where you're told and you'll not mention my name."

When I agreed, he wrestled his bulky frame into a faded mackinaw and stalked out the door.

Everyone spoke to him as we hurried down the steep hill to the water, but he only nodded. We climbed the scaffolding that clung to Triton's armor-plate sides and he waited impatiently while I teetered out onto her destroyer-sharp bow and looked aft.

From where I stood, the Triton stretched more than 400 feet—probably 100 feet or so longer than the former record breaker, Nautilus.

"She's almost as big as a destroyer," he said, warming a little, "but she can fly underwater like the Albacore." He was referring to the Navy's blimp-shaped sub that is "flown" with a control stick like an airplane's. Prototype of a new class of high-speed attack subs, the 1,800-ton Albacore "banks" at 30 degrees and dives for her underwater "floor" like a jet plane.

The Triton is just as maneuverable, yet



She'd churn across the top of the world under polar ice to

she displaces a whopping 5,450 tons.

"What was the biggest sub before?" I asked.

"The French held the record with the *Surcouf*," he said. "It displaced 4,304 tons. The second largest was the *Argonaut*, a U. S. minelayer displacing 4,080 tons. But they were built in the twenties. To see how unusual Triton is, you have to compare her to our newest nuclear sub, the *Skate*. *Skate* weighs in at 2,190."

Cautiously, we edged our way along Triton's narrow deck to the gaping hole for the "sail" (formerly conning tower). I peered down the blue haze of welding smoke. Her bilge, lost in shadow, was almost 40 feet below us. "From her keel to the top of her sail she'll rise over 70 feet," he said.

"What does it take to drive a ship this size?" I asked.

"Follow me," he grunted and started toward the stern.

WE STOPPED and he leaned down to pull back the corner of a huge tarpaulin. Through another gaping hole I looked down and saw the huge container for the Triton's nuclear reactor.

My guide nudged me and pointed to another container farther aft. "Not one reactor," he said, "but two." Triton is the first twin-reactor sub in the world. Her engines probably pull twice the horsepower of the *Nautilus*. She's so powerful she can outrun the *Nautilus* with ease.

I did some fast figuring. I knew that the Navy has never officially admitted to a top speed of more than 20 knots for the *Nautilus*, but her log shows she once cruised from Key West, Fla., to New London, Conn., at "an average speed of 20 knots." A top speed of 30 knots would not be unreasonable then. Could the giant Triton race underwater at 40 knots?

"Triton's range is secret," said the engineer, "but I can tell you that her advanced-design reactors will drive her a lot farther than the 72,000 miles that *Nautilus* went on her first nuclear core."

We climbed down a wooden ladder into officers' country where the clang of hammer against steel and the machine-gun clatter of chipping guns jabbed painfully at my eardrums. My escort yelled above it, "You'd never know it now, but this

will be the most livable ship in the Navy. We've done everything possible—and some things that were impossible—to make the crew happy."

His pride in Triton was beginning to show on his face. I grinned. "More livable than the *Nautilus*?"

HE SWEPT one arm upward "Look at the space," he said. "She's got more decks than the *Nautilus*." I had been aboard the *Nautilus* and I knew that she had two decks, a revolutionary development in submarine construction when she was launched only four years ago. Now here was Triton with three.

I looked up at her high bulkheads and wide companionways and saw that, even though Triton was half finished, her spaciousness compared with many of the Navy's surface ships.

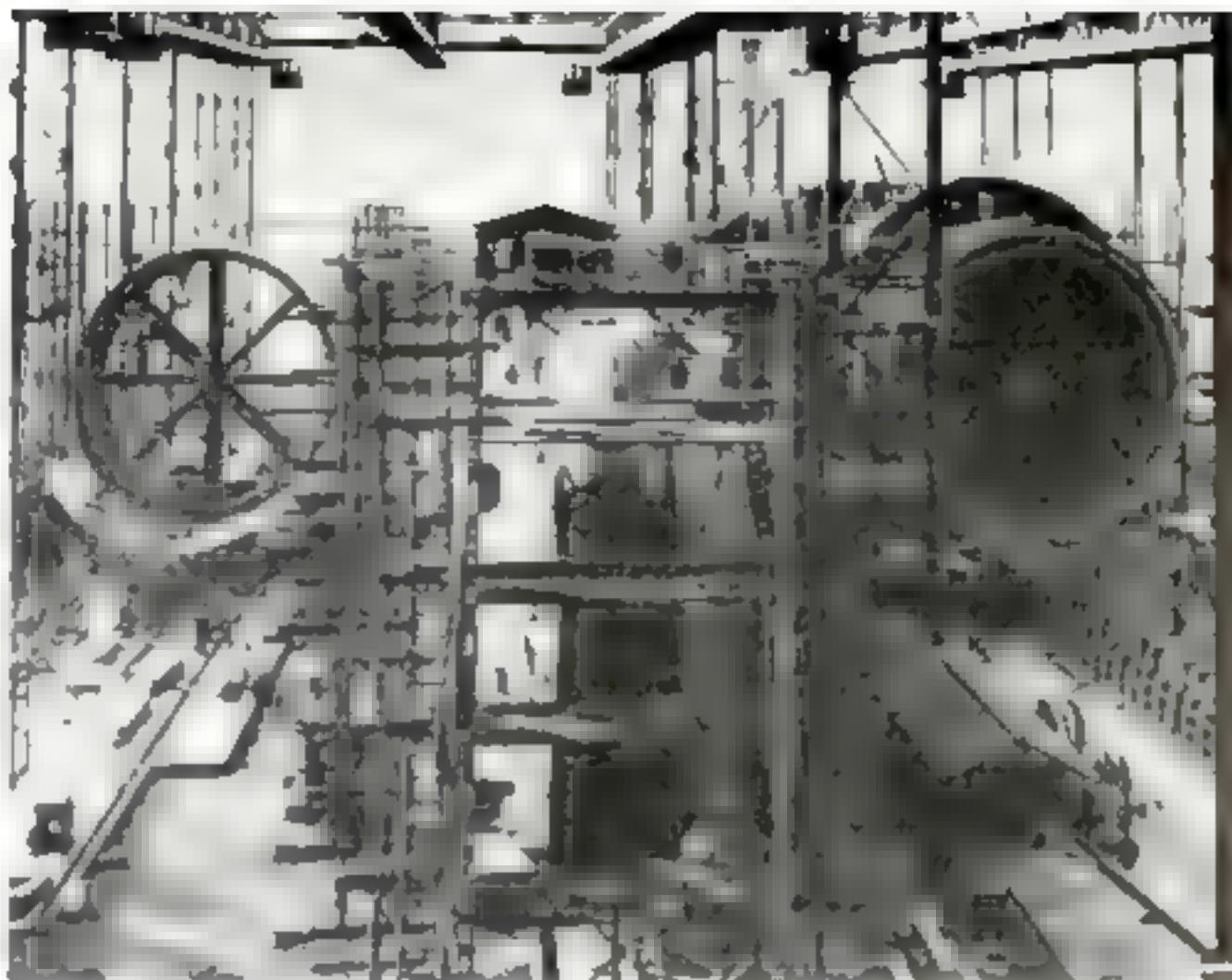
We inched along a catwalk and up a short ladder, emerging into a smoky chamber where the intermittent blaze of the welders' torches threw crazy shadows on the upcurving walls. "This is where she'll earn her keep," he yelled. "In this room she'll have a combat information center like the CICs on the big carriers in World War II, only Triton will carry as much detection gear as you'd have found in an entire task force then."

Outside on the upper deck I looked forward past the welter of workmen to the bow where Triton would launch her torpedoes. Just aft the torpedo room is berthing space for the crew, then come officers' country, the control center, the two reactor compartments, and, in the stern, the two engine rooms. Triton's interior arrangement is the same as *Skate*'s, but her facilities are strung out along well over 400 feet, while *Skate*'s are compressed into 257. *Nautilus*, in comparison, stretches 319 feet.

UNLIKE the missile-firing A-subs, Triton is a radar picket ship. Her job is to range along through the open seas ahead of her task force and find the enemy. And she's equipped to put the finger on everything—missiles, aircraft, surface ships and submarines. She'll carry several radars, a tremendous battery of communications equipment, and new super sonar—the works.

give us warning

ATOMIC TRIO: Lined up side by side on the ways at Groton, Conn., are three of the A-subs in the Navy's building program. From left: Skipjack, Skate and the massive Triton. Skipjack's whalelike hull is designed for maximum speed, while Triton's twin reactors will yield superpower and enormous range



Back in the engineering office, the chill went out of his voice altogether. "Sure she's big," he said. "She has to be. Why, even without her twin reactors she'd be mammoth because she has to carry so much gear and house so many men to maintain and operate it." Normal complement will be about 110 men. Skate's is 75.

I learned from high Navy officials that there are other reasons for Triton's gigantic size. She has tremendous range: She will be able to churn across the top of the world *beneath* the polar ice on Distant Early Warning missions (she could give us much earlier warning of enemy air attack than the DEW line can); she's designed to cruise many times around the world, listening for Russian subs; and she can patrol the outer fringes of a fast-moving, widespread task force for weeks at a time, unsupported—and still, in many cases, be able to repair her own battle damage at sea.

Deep in her cavernous hold are extra coolant pumps, valves and piping. In her huge workshops are the heavy wrenches, welding equipment and pipe-fitting gear found normally only at repair stations on shore. And her extra-large crew will be swelled by men whose mission will be to keep Triton running even when she has taken near-lethal hits.

And take hits she well may. For Triton will go, as the Navy likes to say, "in harm's way." It's a dirty job, but her

mission is to roar in close to the enemy's task force, shoot to the surface, count their noses, then get off her message to the surface fleet, directing carrier-based, A-bomb jets to the target.

IF THE enemy succeeds in zeroing in and it gets too sticky, the skipper will "pull the plug" and dive for the depths. There, Triton can lie quietly beneath the cold layers of water that confound sonar. For hours, if need be, she will rock gently in the deep undersea, her turbines humming quietly but sending out no telltale trails of exhaust bubbles.

Then, her mission nearly accomplished, she will shoot once again to the surface and press forward where she can assess visually the damage our fleet has done.

At Electric Boat they call her the radar destroyer that can submerge. "She can take a lot of near-misses," they said. "She's double-hulled, the only full double-hulled nuclear one in the Navy, and she's as completely compartmentalized as a surface ship. So she can make way even when she's shipping water. Not that she'll take much water. The crew can hold it out by forcing compressed air into a damaged compartment."

"What about nuclear radiation if she's hit?" I asked.

"What we worry about is not that," they said, "but loss of cooling of the re-

[Continued on page 202]

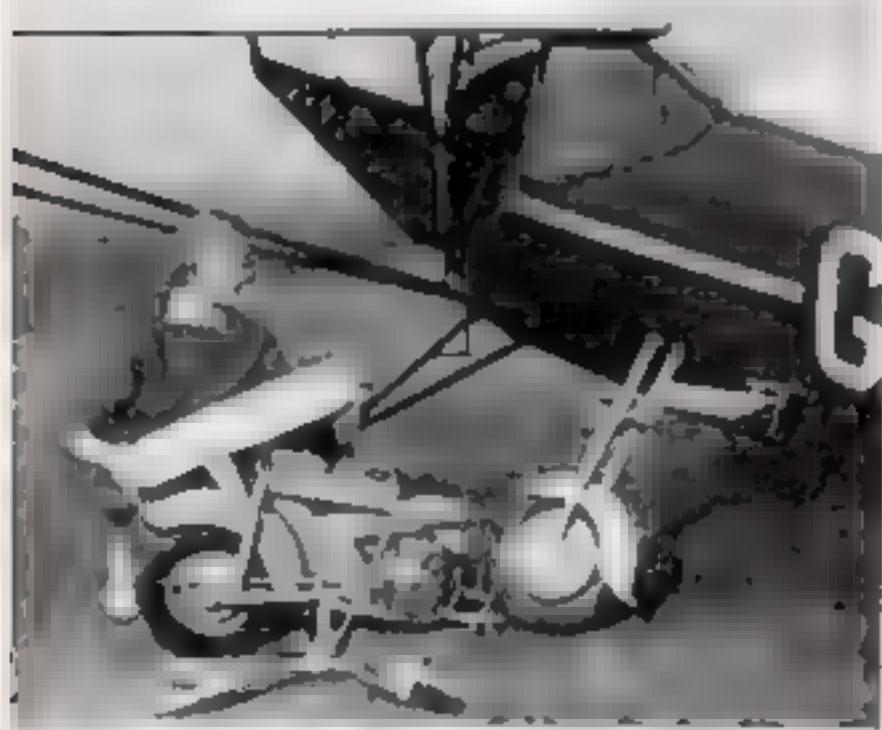


Picture News

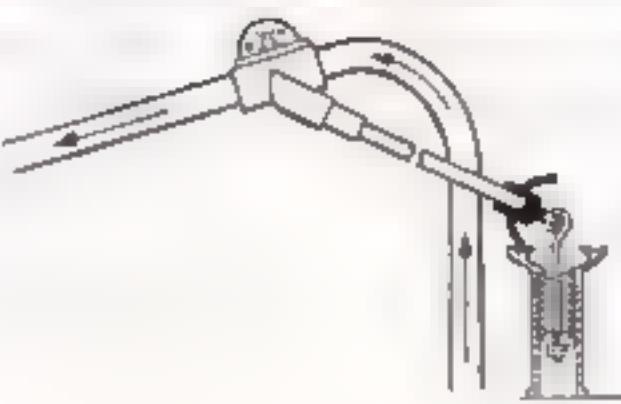
IN THE WORLD OF SCIENCE



Steel colossus bestrides A-power plant. This 170 foot-tall crane straddles the Bradwell nuclear reactor station being constructed on the Essex coast by a British power company. Appropriately named Goliath, it is shown here lifting a 200-ton block of concrete. At left is one of the four giant feet on which the mammoth crane moves on standard-gauge rails. The power station will be completed in 1960.

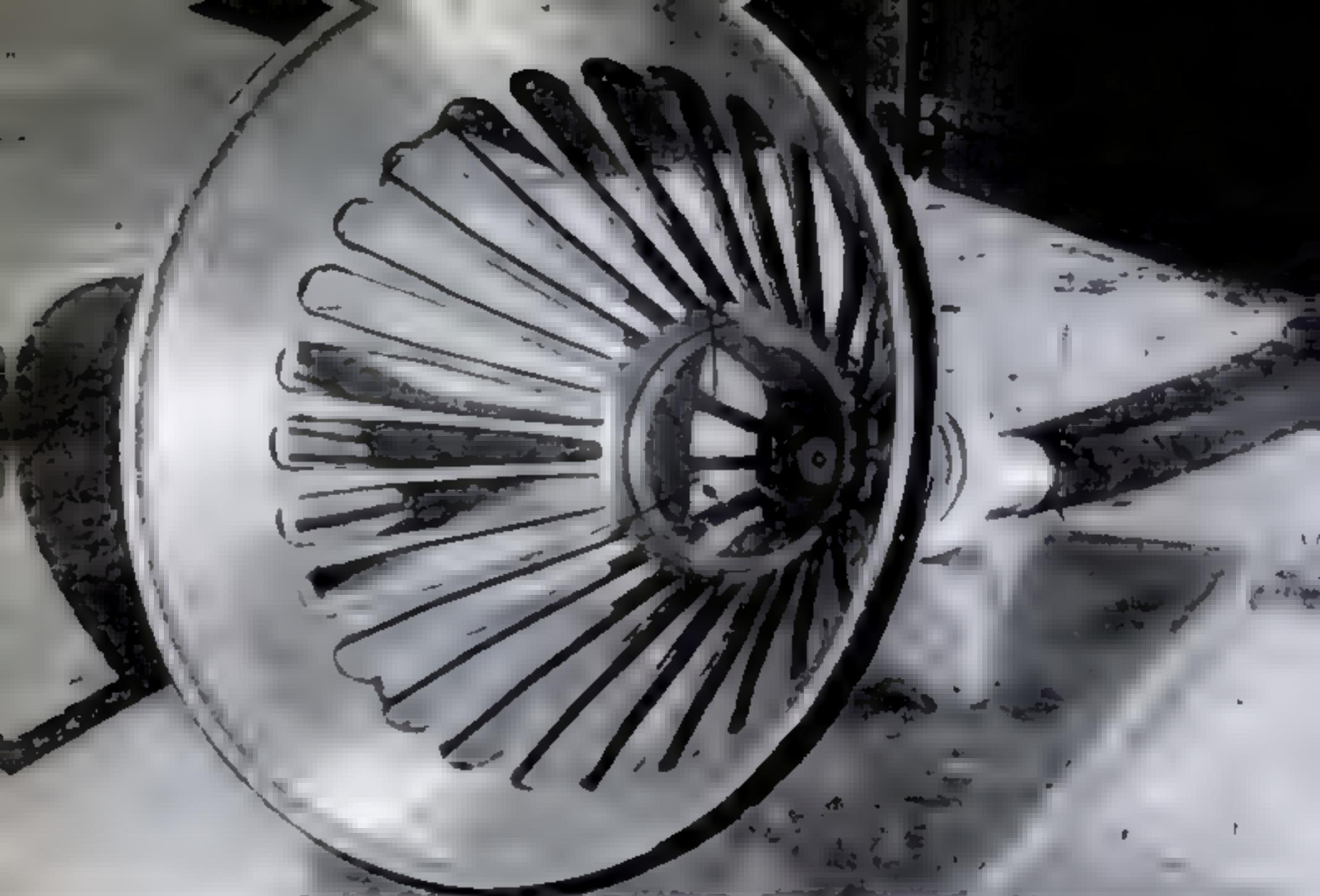


Collapsible scooter. This tiny motorbike is intended to give pilots of small planes personal ground transportation to and from airfields. Its four parts can be stored easily in the plane during flight and assembled at the airport with three wing nuts. It has a double seat and telescopic suspension on both wheels.





Spring-back gas hose can't smear cars. This spring balanced attachment bolts to an ordinary gasoline pump and retrieves the hose without letting its nozzle drag in dirt and grease. W. H. Vestal of Greensboro, N. C., designed it. The hose-carrying stanchion works like an old fashioned roly poly doll—but instead of a counterweight, a heavy spring in its base (drawing at left) brings it back erect when pressure on the 15-foot hose is released. Extending from the top of the pump, it can refuel a car standing away from it in any direction.



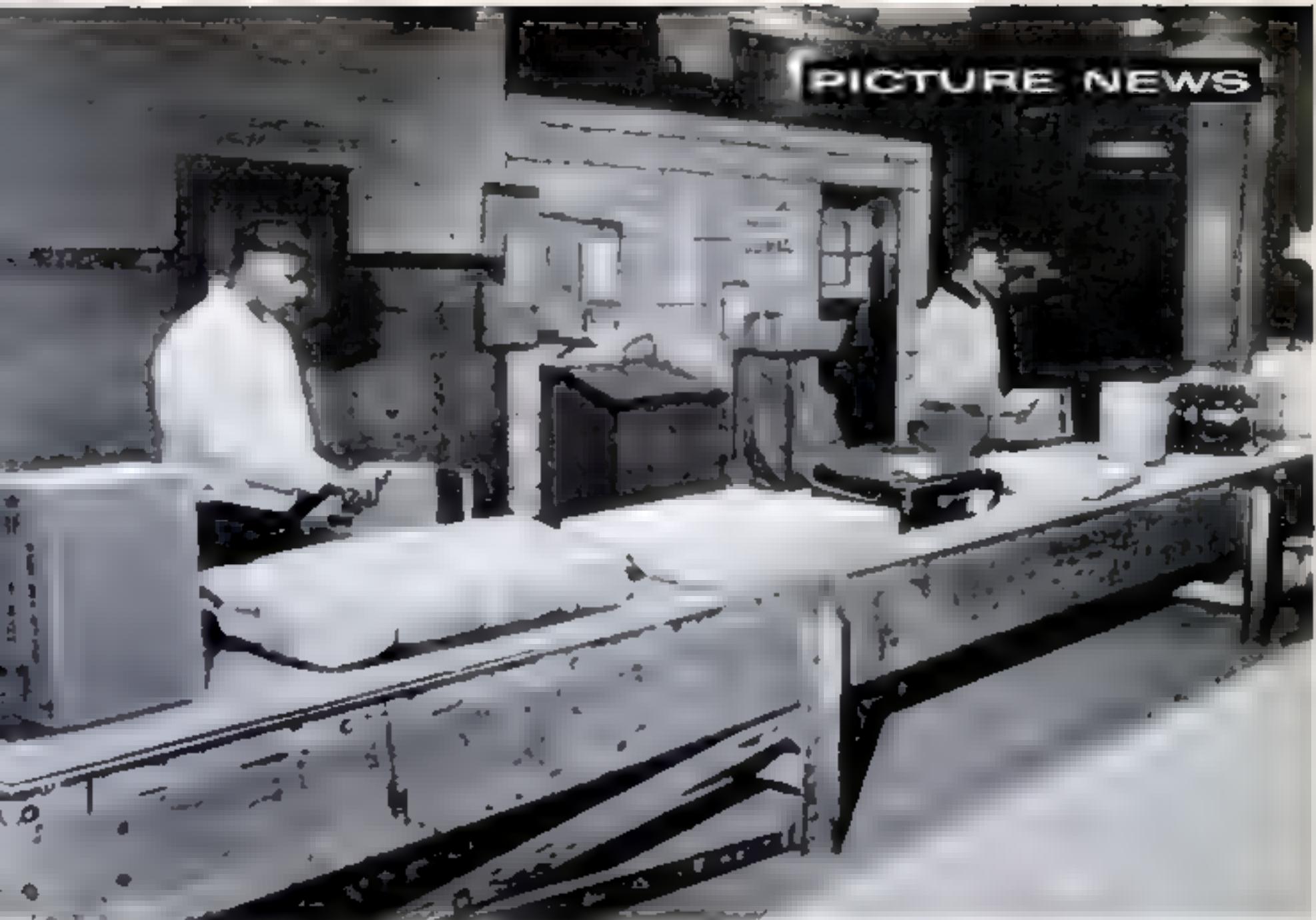
Clip-on refueling package. With this unit (above, right) tucked in its bomb bay, any bomber becomes a tanker capable of refueling jet fighters in flight. British-built, it consists of tank cells, turbine pumps and a 98-foot reeled hose complete with drogue and conical coupling (top photo) illuminated for night refueling. It is used also by U.S. Navy planes.



Elevator truck. This five-ton lift truck can hoist its body up to 13 feet to line up with the loading bay of any aircraft in the world

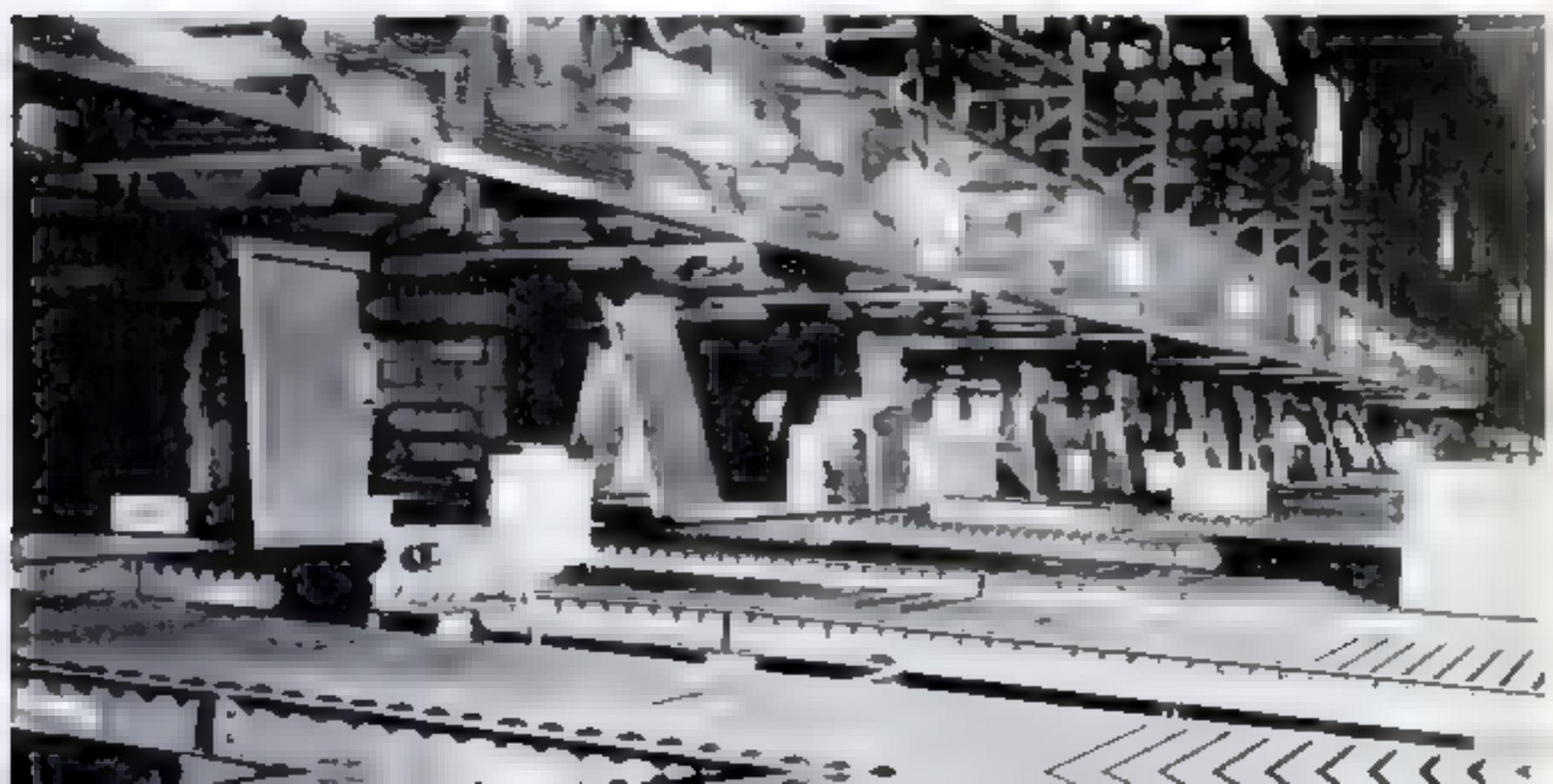
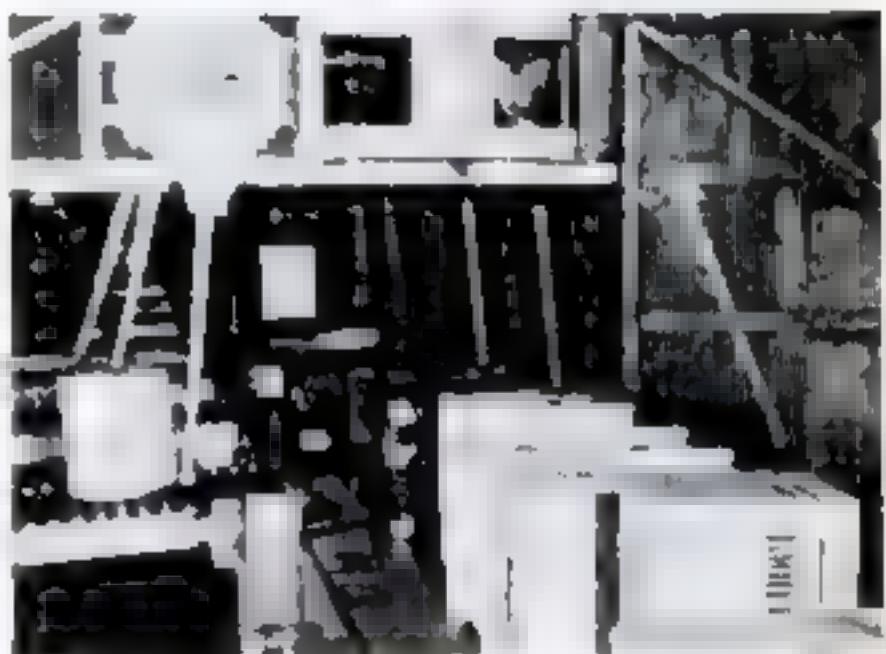
It has an auxiliary flip-up sidepiece that acts as a bridge to reach the head of the passenger stairway at left and a power-operated tailboard that alone will raise up to a ton of cargo.

A rubber bumper on a front bridge turns on a warning light inside the cab if the truck touches the plane fuselage. The truck loads from the back, unloads from the front above the driver's head.



Speedway for parcel post. Packages now get on trains faster thanks to electronic brains. Here's how a Stewart-Warner system works at Pennsylvania Railroad's station in Philadelphia

Packages too big for sacks are placed address up on a conveyor and their destinations punched (top) into an electronic memory. An electric eye (right) records time as they pass. The brain then reads the destination code and pushes them by chain-and-sprocket paddles (bottom) off the main belt to rollers that take them to any of 39 different trains.

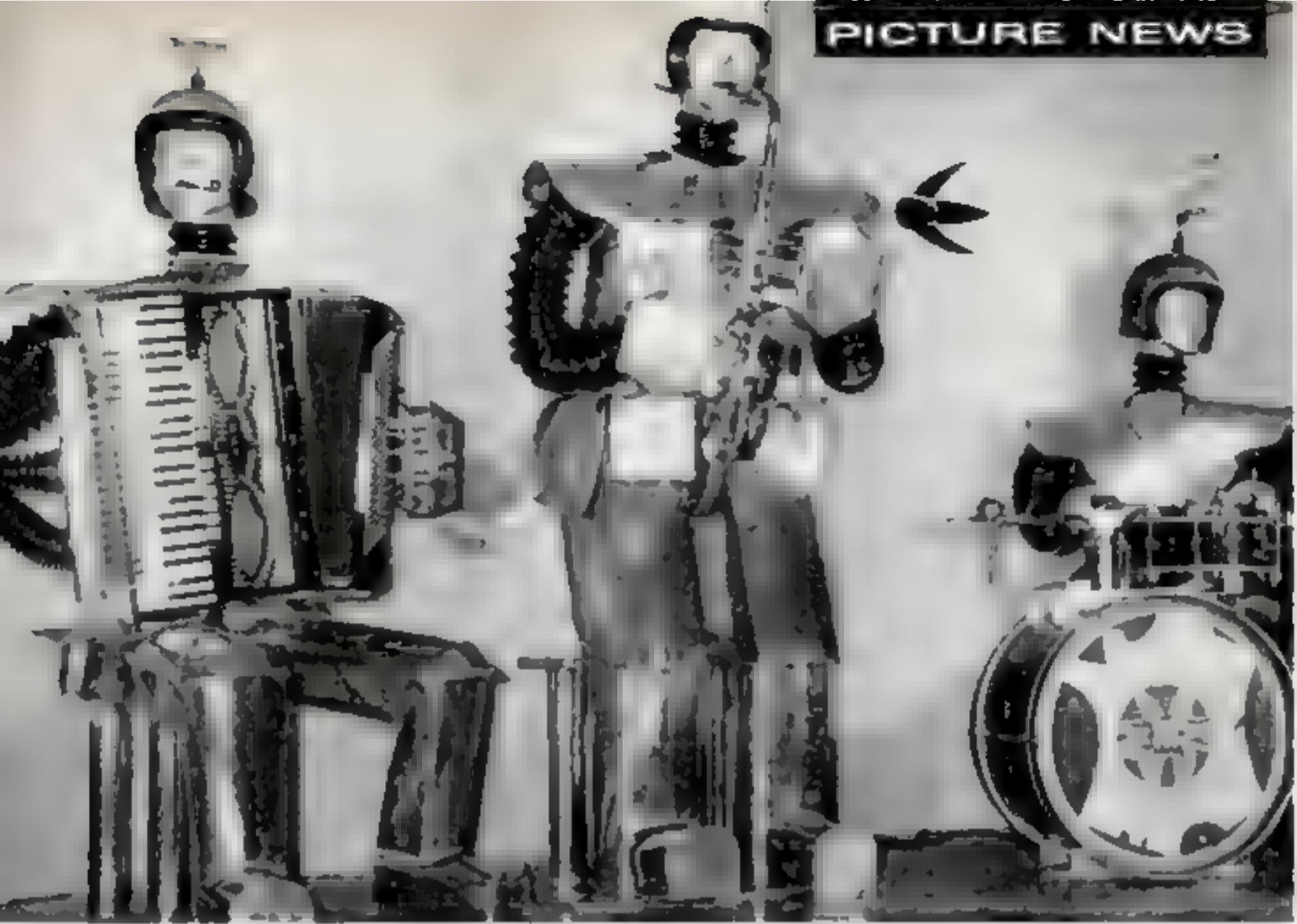




Plane's tail now a trailer. When a Dakota transport came to grief at Croydon Airport, farmer Claude Jesset of Hadlow Downs, Sussex, latched on to the tail section for \$50. For \$40 more he converted it into a trailer. It's wired for lights, has a built-in bed, kitchen and dinette.

Circular camera takes cone-shaped photo. The 200-degree panorama below of Rockefeller Plaza, New York, was snapped by the camera at far right. It runs by gears and a spring-wound motor, works by rotation and scanning, and takes pictures with an f 4.5 lens on four-





Robot dance band. These Martian-looking cool cats swing, not by ear, but by electronic tape. They are the latest rock-and-roll fad at a popular Paris night club. Instruments are the real thing. Drums are beaten, the accordion fingered and squeezed, compressed air blown in the sax.

by-five film. Flat prints (center) show partial duplication that is overlapped when they are cut on a radius and formed into a cone. Dr Eugene Trachtman, Red Bank, N. J., inventor, visualizes astral and plane-mapping use. One of his views is displayed at the Brussels Fair.





Traveling mailbox. Letter boxes are attached to buses making the regular routes in Naples and other large Italian cities in a scheme to speed up mail deliveries. Here a tourist posts a letter in a box that will be emptied within the hour at the central post office which all buses are scheduled to pass. The legend "servizio celere" painted on the box means "fast service." And that's what the Italians get.

Travelling wind tunnel. Instead of building an expensive wind tunnel to test models of new planes at its Canadian plant, De Havilland mounts them on top of a flying test bed. Results are the same: model performance under the desired wind velocities. Below, a model of the Caribou, De Havilland's new twin-engine utility plane, rides piggyback on an Otter.

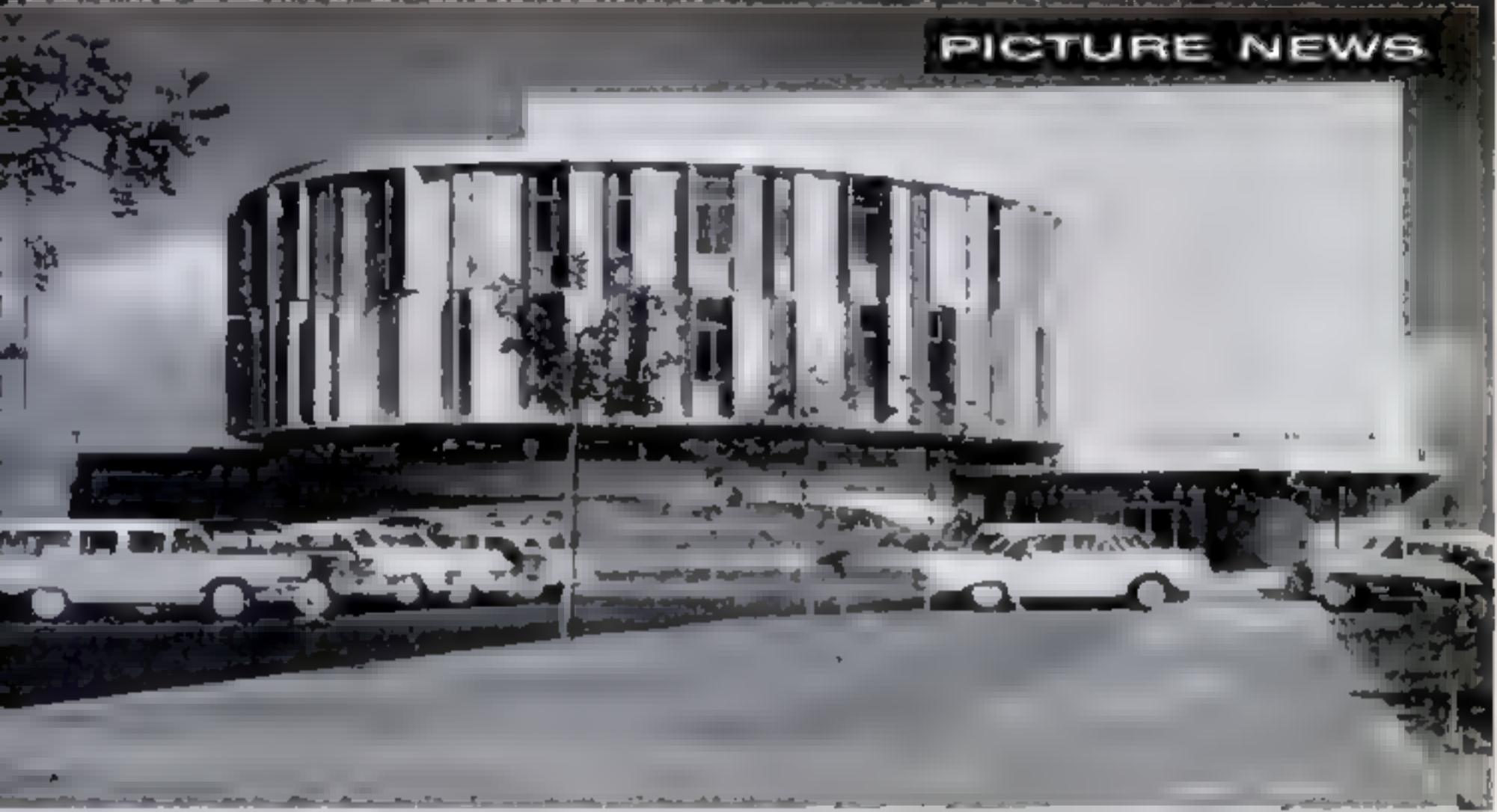




Classroom to schoolyard to water. Safety in handling boats is taught to teen-age youngsters as an optional course—first of its kind in the country—at Terry Parker High School in Jacksonville, Fla. At top, Principal Sidney Friend gives instructions in theory to his water safety class; center, enthusiastic students get a close-up view of the school's outboard runabout; bottom, a group practices on the St. Johns River.



Lite-Jacketed Polaris. This dummy missile simulating the Navy Polaris reports via electric cable (left) on its own launching before falling into San Francisco Bay. There a tethered life preserver on its nose floats free to mark the spot, and a giant crane recovers the dummy for another test. Subs will launch the real Polaris from underwater.



Circular hospital helps nurses get around. Hub-and-wheel floors reduce walking time of nurses at the 63-room Valley Presbyterian Hospital at Van Nuys, Cal. Instead of facing dead-end linear corridors, attendants pass directly through nurse stations to the patients' rooms. Pereira & Luckman of Los Angeles and New York were the architects.

Telescoping gangplank. A new covered ramp to keep passengers dry in wet-weather boarding is now in service at Chicago's O'Hare Airport

It extends in three sections from 55 to 107 feet and rotates at the terminal entrance in a 120-degree arc to fit snugly against the loading door of an airliner

Its free-swinging end is carried by a power-driven dolly that supports its weight, moves it into line with the plane and adjusts its height by means of hydraulic cylinders. Inflated rubber pads cushion contact with the fuselage





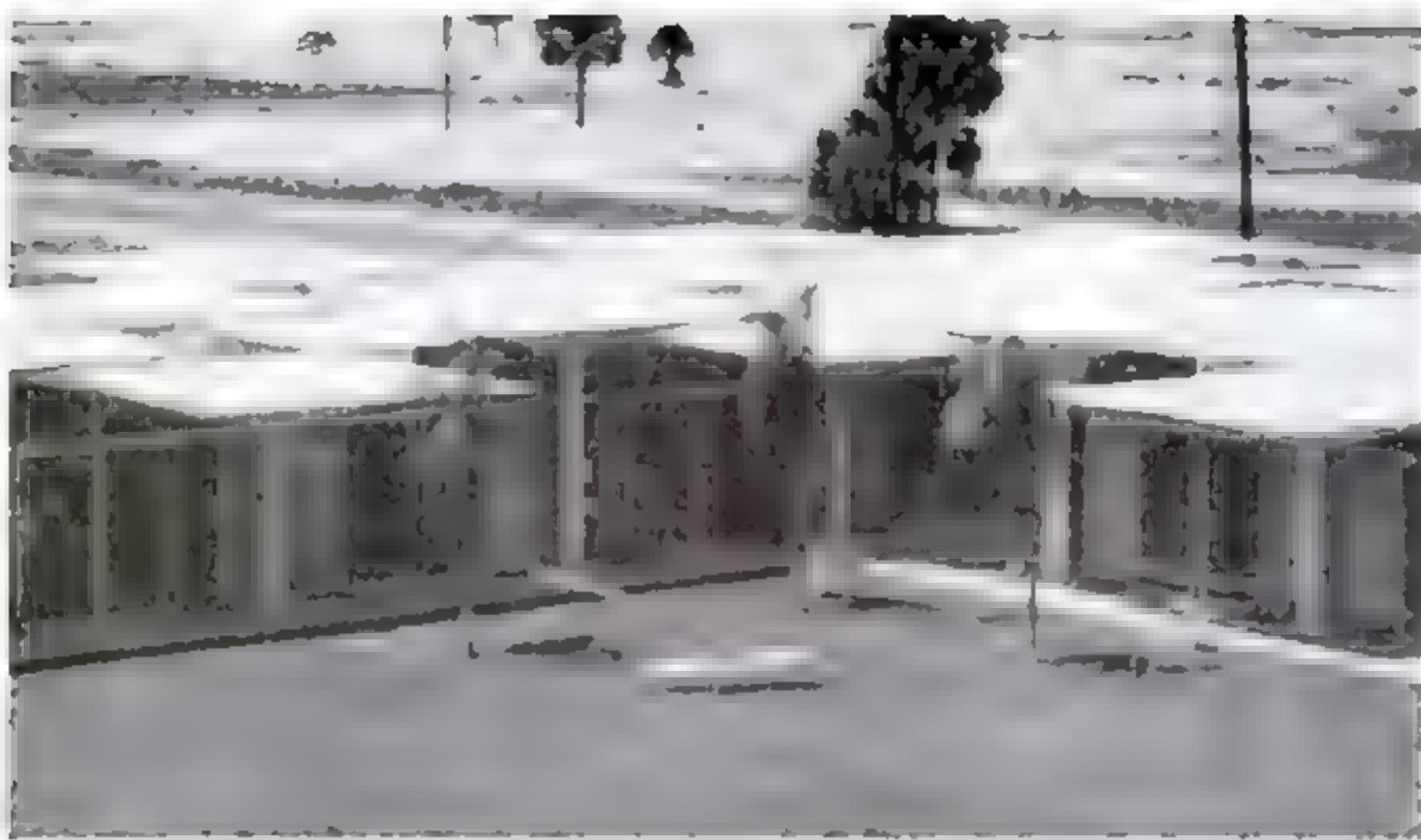
Speed-loading a cargo giant. At a special loading dock at its home base (Dover Air Force Base in Delaware), this big C-133 carrier takes on between 50,000 and 100,000 pounds of high priority NATO supplies for Europe. Cargo is piled on pallets which are pushed onto rollers set in the ramp, and speeded into the C-133's cavernous maw. Loading can be completed in 10 minutes with the conveyor ramp.



Sub-satellites made of aluminum foil. Easiest to see of all man-made satellites is the shining 12-foot aluminum balloon at left designed for launching, collapsed, in a Vanguard nose cone. It will be inflated by nitrogen. In the foreground are two 30-inch versions, blown up and folded flat, and at right a corner reflector that bounces radar waves. All are made of Reynolds foil similar to that used in kitchens.



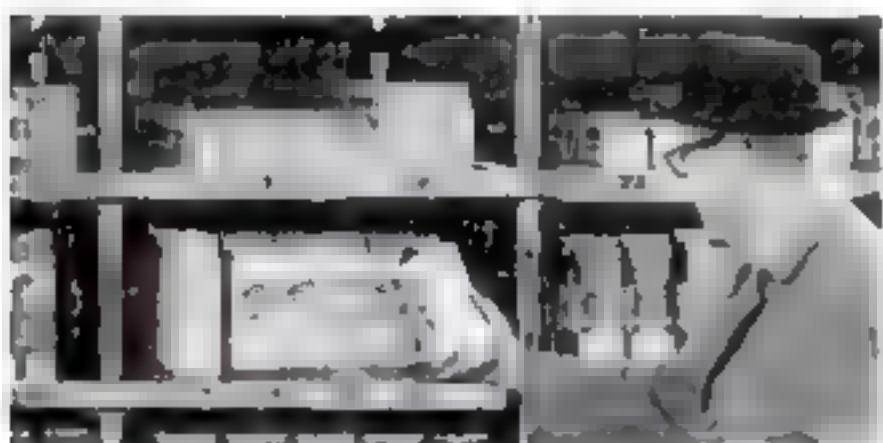
Carpet of flowers. This roll-out mat needs only watering to grow flowers all summer. Made of organic material, it contains 30 different kinds of seed, weed killer, and enough plant food to stimulate several months' growth. Photo at right shows the flowers beginning to bud. Mats come in rolls $\frac{1}{4}$ inch by one foot by 18 feet. They can be cut to flower-box size. Horticulture, Inc., New York City, sells them at \$3.98 a roll.



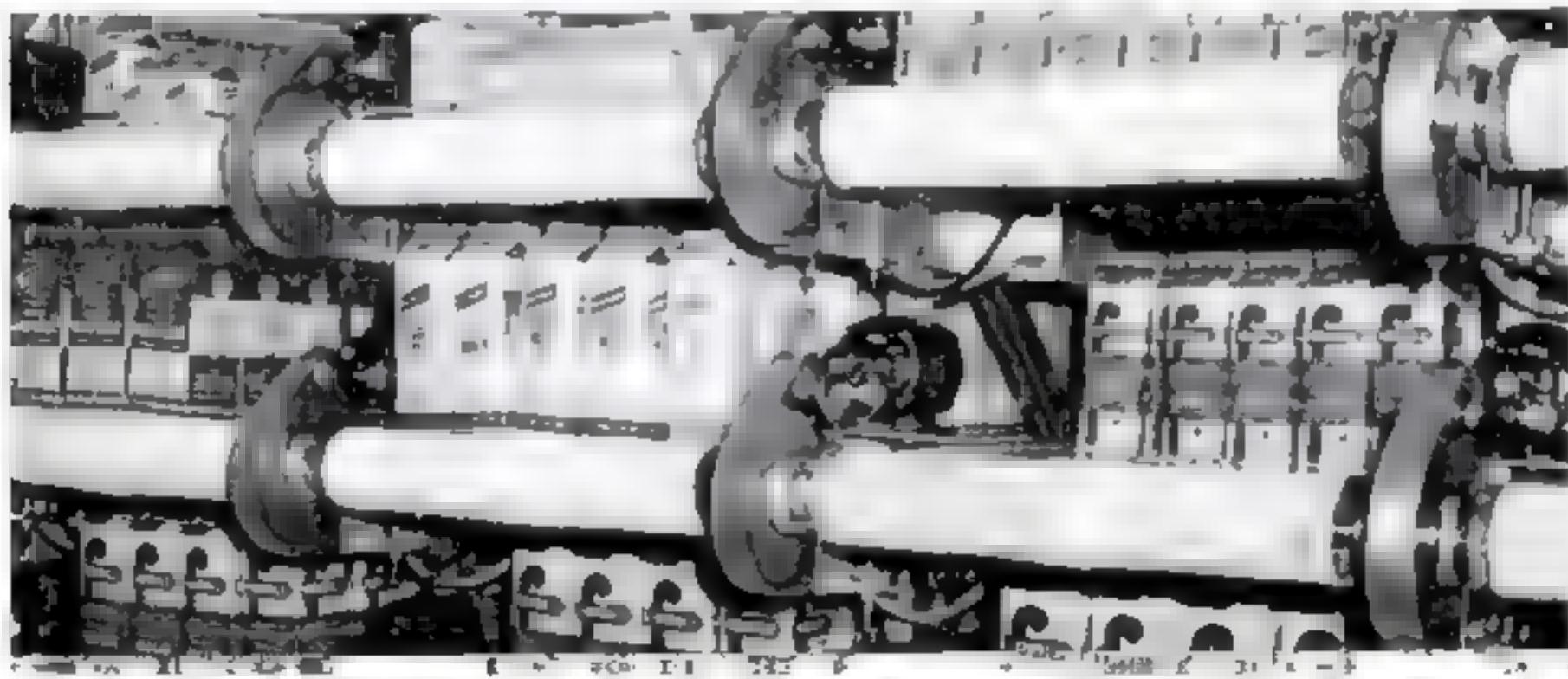
Cocktail-glass roof. Concave slabs of concrete, each supported by a single stem, form a roof for a motel near Venice, Fla. It's said to be hurricaneproof.

Shells are placed on two staggered levels, each a few inches higher or lower than its neighbor. Rainwater drains into a pipe embedded in each central column.

At right, a precast roof section goes into place with old tire casings on the ends of derrick ropes to prevent damage to the corners. The design won an award for architect Victor Lundy of Sarasota.



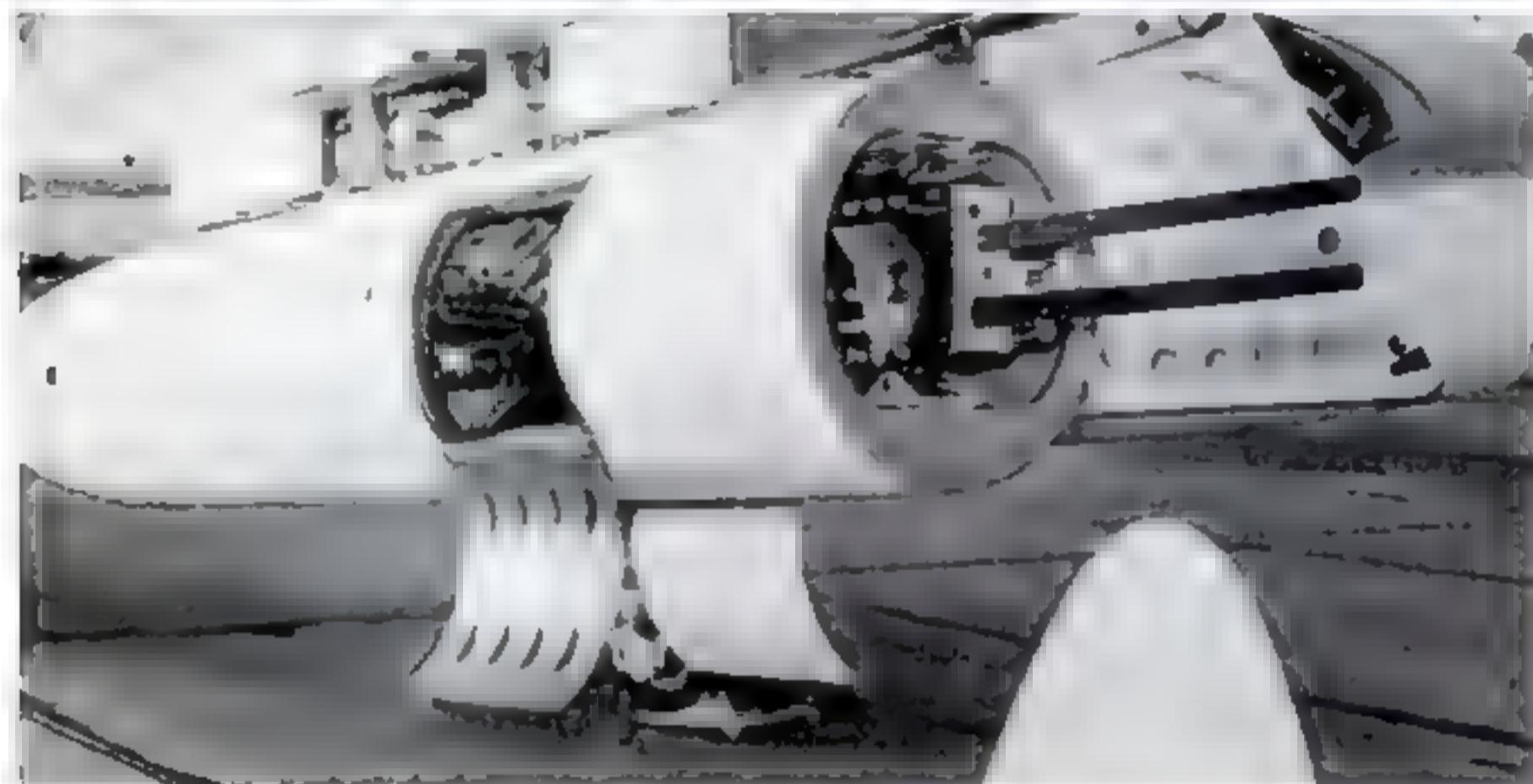
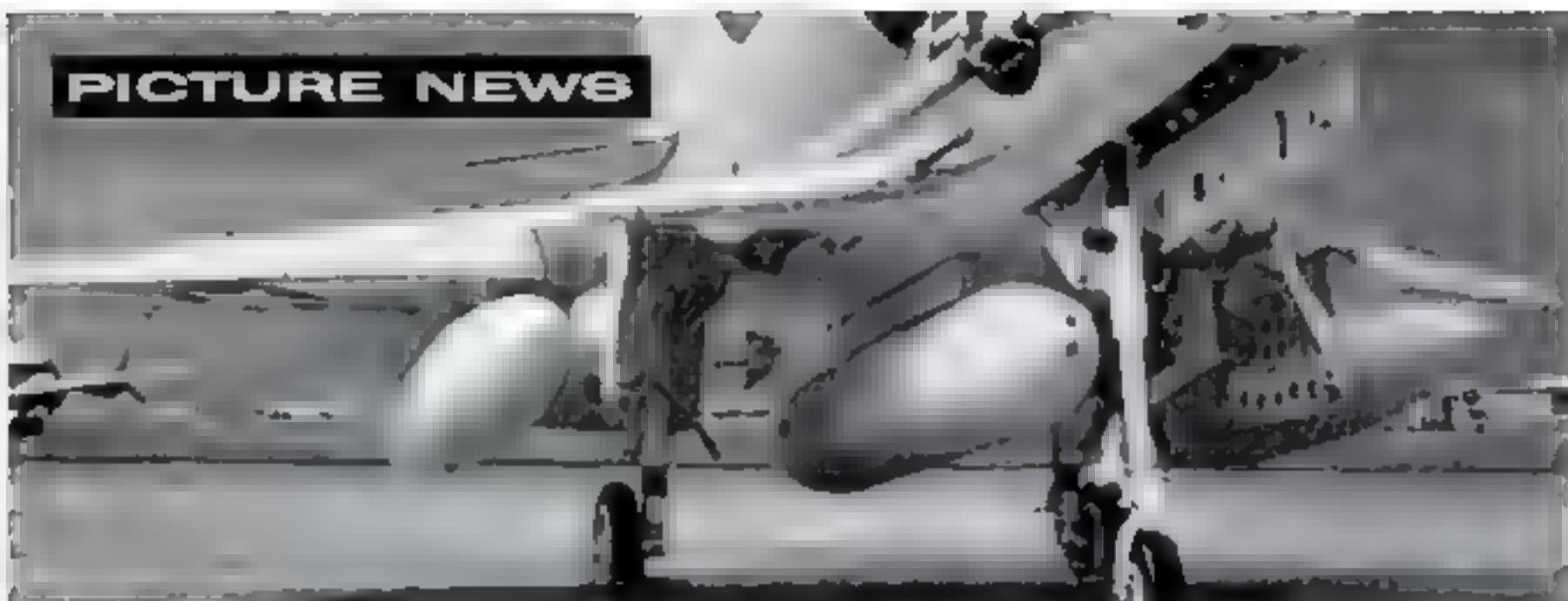
Air-curtain refrigerator. A gentle flow of air is the only door in this vertical refrigerated display case in a Minneapolis supermarket. Shelves (seen below from rear) are motorized endless belts. Lifting the last carton of milk or other item from front row actuates the motor to bring up the next row of goods. The shelves are reloaded from the rear.





Catching signals from outer space. These circular antennas will pick up radar signals from the Atlas ICBM as it streaks through the ionosphere—the area 50 miles up and extending far into outer space. They'll help scientists at the Cape Canaveral, Fla., test center gather data on electron density, an important factor in missile guidance and radio communication.

PICTURE NEWS



Gun-in-a-pod. Here the Navy shows its new Mark II aircraft gun for the first time. It's a double-barrel 20-mm. automatic cannon that delivers eight times the firepower of similar guns of World War II. It was developed by Hughes, and can be attached or detached quickly, jettisoned in flight. Here gun and pod are on a Douglas A4-D Skyhawk.

Russian bus rides the waves. The "aquabus" below is now in regular service on Soviet waterways. Its cabin is fitted like a highway bus, but it carries 66 passengers at half standard bus fare. The hydrofoil craft is 90 feet long, has a 15-foot beam, is powered by a 900-hp motor and rides three feet out of the water at the prow at top speed, 43 m.p.h.



How Safe Are You? What Kind of Shark Is It? Is It Hungry?



The white-tip, an accused but not proven man-eater, plies the Atlantic. Note two pilot fish.

***The biggest is so lazy you can bump right into him—but
DON'T try that with the man-hungry White or the Hammerhead***

By Gardner Soule

THE most qualified man I could find answered my question: "Do sharks attack people?" "They do."

Afloat and ashore, Harvard's Bill

Schroeder has studied sharks for 40 years. He has hauled them up from Nova Scotia to the West Indies. At Harvard and at the Woods Hole (Mass.) Oceanographic Institution where I found him, he pores over reports of their activities. Schroeder and Dr. Henry B. Bigelow, also of Har-



OXYNOTUS' TOOTHY GRIMACE is familiar sight to Mediterranean fishermen.

vard, are the authors of the outstanding encyclopedia of sharks: Volume I of *Fishes of the Western North Atlantic* (Sears Foundation for Marine Research, Yale, \$10).

I asked the question because a number of people, including some skin divers, are going around saying sharks are harmless. "Not true," Dr. Schroeder says. "There are too many verified instances of sharks attacking men."

He showed me an account of a man fatally bitten off North Carolina. "In the West Indies, where I've been often," he said, "some of the native divers go down among sharks without hesitation. Still, every now and then one gets bitten."

"Around Sydney, Australia, there's a large number of attacks—the most anywhere." These Australian incidents are likely to be tragic. The records show that one in two persons bitten by a shark there dies. So Australia has put wire netting around some of its beaches, and has established a shark patrol—guards who watch for fins cutting the water.

"Of course I don't say that all species of sharks attack men," Dr. Schroeder continued. "Most don't. Not even all of the species known popularly as man-eaters are suspected by scientists of being dangerous. But there's always a bad actor that comes along."

The species that makes the Australian beaches the world's most fearsome is the

Sharks' innards have revealed sea

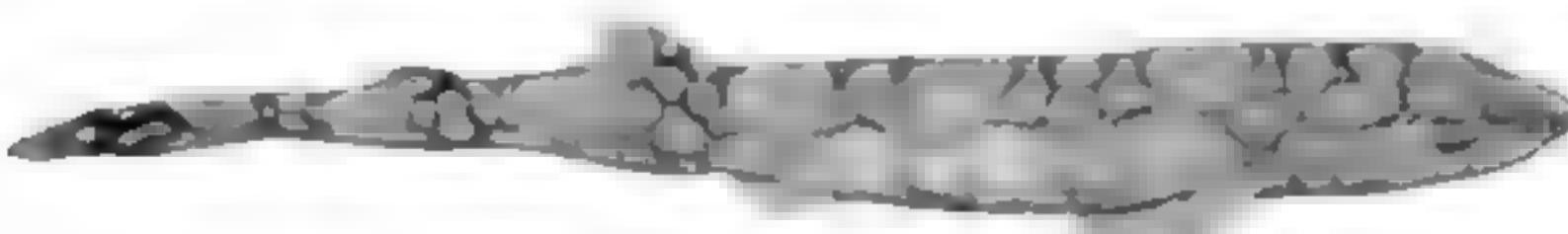
creature known as *the man-eater*: the White shark. He is by no means active only near Australia. In fact, he is cosmopolitan: He roams the tropical and temperate oceans of the world. He shows up as far north as the Gulf of Maine. He is the only shark known to battle small boats. Last summer in Massachusetts Bay a harpooned White turned on a boat and bit it. "Left quite an impression of his teeth," says Dr. Schroeder.

That a White shark could swallow and digest a large hunk of man is indicated by what actually has been found in their stomachs: entire sharks four to seven feet long, a whole 100-pound sea lion, seals, sturgeons and turtles. Nor does he limit himself to sea fare. He has also swallowed horse meat, mutton, pork, and once a whole Newfoundland dog complete with collar. One shark, when opened up, was found to have gulped down a packet of ship's papers, and he is suspected of having been a White. But it happened too long ago to be sure.

Back in 1916, four people were bitten to death off New York harbor. A White shark, caught a few days later, may have been the culprit. This man-eater is one of the big sharks: A specimen caught in Cuba weighed 7,000 pounds, had a 1,005-pound liver, and was 21 feet long. But Australia claims the whopper: The Aussies hauled in a 36½-foot White, with teeth three inches long. You can see his jaws in the British Museum in London.

"I DON'T mean to imply that off New York or New England you're in great danger from White sharks," Dr. Schroeder says, "because you're not. They are not really plentiful anywhere—even around Australia." Besides the New York incident, the only other 20th Century fatality off the U.S. northeast coast that probably was due to the White shark was that of a boy fatally bitten in 1926.

Statistically, your chances of being bit-



CHAIN DOGFISH and many of his relatives lurk near the New England coast.

lions, ship's papers, Newfoundland dogs, shoes—and men

ten, near any American beach, are very, very remote. Unless, of course, it is known that a shark of a dangerous kind has been in the vicinity.

One thing to give a swimmer pause: The stomachs of many sharks, especially the larger ones, when opened, are often found to contain nothing whatever. So it is probable that sharks are usually hungry.

The White shark is not the only man-eater you may encounter off U. S. shores. There is the Hammerhead. He is one of the cannibal sharks—known to consume other Hammerheads. According to an early account, one Hammerhead was found to contain some human remains. Had the shark been the killer? There was no way of telling. Then came a verified attack by a Hammerhead upon a swimmer at West Palm Beach, Fla., in 1913.

Hammerheads in great schools swim north along the Atlantic coast in summer. They go right into coastal bays, even into New York harbor. They grow to 12 or 13 feet and 900 pounds and when hooked they put up a shark-sized battle.

THE contents of stomachs tell much about sharks, and of all those that show up off the U. S., the Tiger or Leopard has displayed the most voracious appetite. He has contained: sting rays (poison spines and all); great chunks of sharks, including other Tigers; crabs, birds, sea turtles, spiny lobsters, skates; and even such indigestible items as lumps of coal, tin cans and empty sacks.

The record Tiger, caught in Cuba, was 18 feet long. There and in the rest of the West Indies he's considered the most dangerous shark. Australians began to agree when, on one occasion, they caught a Tiger and he vomited up a man's arm. But the arm was proved to have come from the dismembered body of a murder victim. Besides his appetite, the Tiger has another attribute that could qualify him to be a man-eater: His big, coarse, rolling teeth cut like a saw through the cast-iron hides of other sharks and the shells of the biggest sea turtles. It is possible that he also eats men; proof is lacking.

Stomach contents can sometimes be misleading. A tremor went around the world a few years ago when one shark,

caught near the Philippines, was opened and found to hold 47 buttons, three leather belts, seven leggings, and nine shoes.

All this incriminating evidence came out of the belly of a specimen of the world's biggest fish: the Whale shark. He is known to reach 45 feet and may attain 60. One caught at Knight's Key, Fla., weighed over 25,000 pounds.

The evidence, however, did not mean what it appeared to. For the Whale shark eats plankton (minute one-cell plants and



THIS ANGEL SHARK was caught in shallow water off the coast of Massachusetts.

animals), crustacea and small schooling fishes. He obtains this food by cruising slowly on the surface with his mouth open, and gulping anything—including buttons, belts, leggings and shoes—that floats in. His danger to man is not his bite. He moves so slowly that he won't even get out of the way of your boat. You can bump right into him, and some ships have. But he can deal you a lusty swat with his giant tail.

Next biggest shark, the Basking, eats the same things and obtains them the same way. He gets to be 35-40 feet long. A 30-footer weighed 8,600 pounds. If you see Basking sharks, as you're likely to do off either the Atlantic or Pacific coasts, you'll not forget them. They are found in schools of possibly 100 or so. Many people think they're sea serpents. This is because their snout, back and a couple of fins often show above the surface, and because they sometimes swim in line after

each other—the caravan looking like one long, writhing animal.

The stomach contents of the Mako, another suspected but unconvicted man-eater, are also impressive. One 730-pounder contained a 120-pound swordfish, the sword almost intact. Another Mako, over 10 feet long, weighed 1,009 pounds.

THREE are two other accused (but unproved) attackers of men among sharks on U.S. shores. One is the Lemon, of Florida and the South. He's strictly an inshore species, and is known to eat refuse around wharves. Though charged with attacking bathers off South Carolina, he hasn't been proved guilty. He reaches over nine feet.

The other is the Bull (or Ground) shark, a 10-foot, 400-pounder that hugs the shore and is caught from docks and in harbors at Galveston, Tex., Charleston, S.C., Bermuda, and points between. You may even encounter him far inland: He's been reported 160 miles from the sea in Louisiana's Atchafalaya River. The Bull has been called a man-eater, but his tribe is so plentiful that if he did have a taste for human flesh, shark bites would be much more frequent.

Indeed, by far the most sharks you're likely to meet are harmless. Take the Nurse, which frightens people with its fin cutting a surface. This Southern citizen enters water as shallow as one foot deep, lies motionless, lets you approach. He is harmless to men—so harmless, in fact, that Hollywood uses him for the battles it stages with "man-killers of the deep."

Another inshore dweller is the Sand, who will lurk in two to six feet of water anywhere along the Atlantic coast. The Sand is one of the few sharks that have done anything indicating brainwork: Off New Jersey, they are said to have been seen chasing bluefish into shallow water, corraling them to eat them at leisure.

If you go out to sea, you'll find the Great Blue shark: brilliant blue above, snow-white below. He has reached 12 feet, seven inches. He eats herring, sardines, anchovies and flying fish, and he gathers with great numbers of his kind to chew up dead sperm whales. He is a ship

follower, waiting for garbage to be tossed overboard.

Are sharks fast swimmers? Not many of them; most can manage spurts of only 100 feet or so, say the experts. Take the Mackerel shark, found in both the Atlantic and Pacific. One of the most streamlined of sharks, he is a swift, powerful swimmer—in a short chase. Caught, he offers only feeble resistance.

"**P**EOPLE think of sharks as big," says Schroeder. "That's because they usually see only the large surface ones. But most species are small."

By far the commonest shark, off New England and the mid-Atlantic states, and also found in the Pacific, is the Spiny Dogfish. He reaches only about three feet, runs seven to 10 pounds. He causes fishermen untold trouble by gulping their bait. On a 700-hook line, near Cape Breton, once there were 690 Spiny Dogfish to be gotten rid of.

There are even tiny sharks, mostly from the depths, that nobody except shark specialists ever heard of. There is one that matures and bears young when it's six inches long. There are others, usually small in size, that are luminescent, giving off a vivid greenish glow.

Of all the 250 or more species of sharks, only five or six are reported dangerous to men—and some of these without proof. Most sharks are either too small, too sluggish, too weakly armed, or live at too great a depth to be of any potential danger.

On the other hand, as Schroeder and his partner Dr. Bigelow point out, there are unquestionably species, voracious, large, active, and armed with very effective teeth, that habitually feed on large prey. Such a shark can lacerate a man in a moment so he bleeds to death. One bather attacked by a shark in Florida was saved by 300 stitches. Many are not that lucky.

So if you see a fin or the shark himself, don't wade or dive in to see what will happen. And if you're swimming from a ship or boat at sea, always post someone on deck to watch for sharks. Men like Dr. Schroeder, the men who know sharks best, never take a chance.

END

Next Month: What makes a 180-m.p.h. boat so fast? Ted Jones, designer of the hottest U.S. hydroplanes, tells you in August PS.

New Ideas from the Inventors

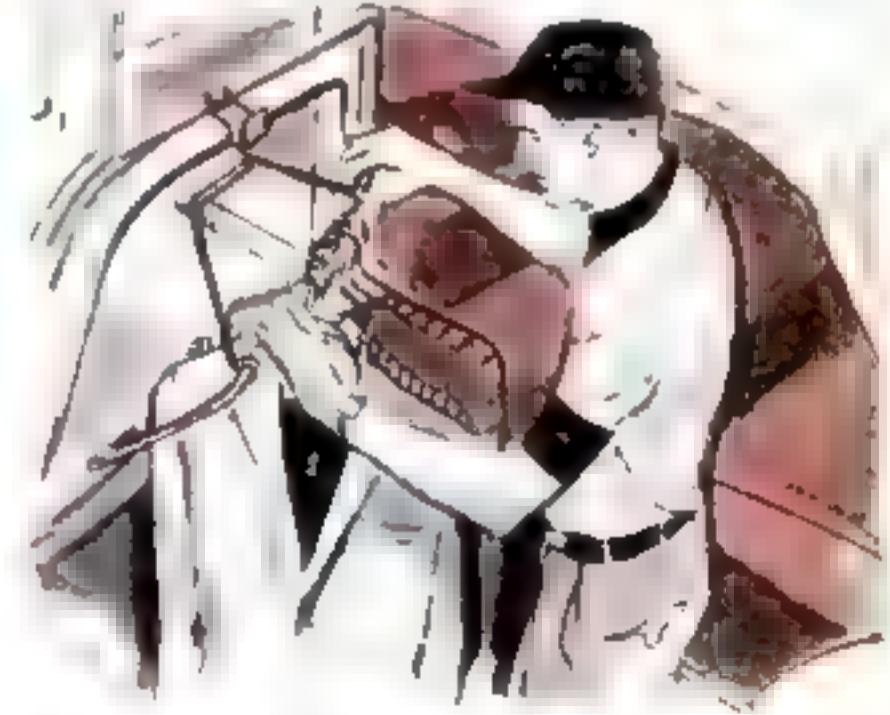


1 Buzzer Lets Fisherman Nap. With this recently patented signal clipped to the side of his reel, an angler could relax between bites. He'd loop the line

over a switch lever so that the pull of a hooked fish would sound a buzzer or flash a light. The signal would also be useful for fishermen who work two or three lines.

2 Ear Form Evens Sideburns. You'd have no trouble keeping your sideburns even—and equal—with an ear-fitting form like this to backstop your razor. Half of the shaving aid would be shaped to fit the left side of your face; reversed, the opposite half would fit the right ear.

3 Car Frame Hangs Clothes. This detachable window rack with its notched bar for spacing the hangers might lessen crushing and wrinkling of clothing on car trips. At stop-offs, you could lift rack and garments together and transfer them to a closet. It would fold for trunk storage.





4 Pool Signal Guards Swimmers. By interrupting sonar-like waves, swimmers in this pool would automatically signal their presence. In one version, a time-delay circuit—and a beam focused across the pool bottom—would sound an alarm if anyone stayed under too long.



5 Directory Dials the Phone. Dr. Lee DeForest, the "Father of Radio," would use an electrically driven finger—guided by punched cards—to dial frequently called numbers faster and more accurately. The device wouldn't interfere with manual dialing of unlisted numbers.

6 Canopy Protects Picnic Diners. Sudden rain couldn't dampen your outdoor meals (nor would flying insects beat you to the salad) if you carried this table-

tent as part of your cook-out gear. The folding frame would clamp to any standard picnic table, and the fitted canopy would enclose table and diners.





7 Plumber's Rule Checks Angles. To simplify pipe measuring and fitting, this inventor would combine a steel measuring tape with three "bubble" tubes that would quickly check the main pipe settings—vertical, horizontal, and both inside and outside 45-degree angles.

8 One Can Opens Another. If you've ever been on an outing and found that no one remembered to pack the bottle opener, you might like to stock up on beverages put out in containers like these. A metal insert in the bottom of each can or bottle would serve as a cap remover; it would be recessed so it couldn't interfere with normal stacking or storing.



9 Scraper Cleans Ceiling Cleanly. With this long-handled scraper you could remove paint, paper or plaster from a ceiling without ever mounting a ladder. The poised receptacle would catch most of the scrapings. Paintbrushes and rollers that could be fitted to the same handle would help you complete the refinishing job.

The following patents have been issued on these inventions:
 1 No. 2,811,940 to R. L. Stager, Kansas City, Mo., 2 No. 2,799,923 to J. M. Daniel Bridgeman and E. J. Hultgren, Fairfield, Conn., 3 No. 2,747,781 to H. A. Schufeld, Dallas, 4 No. 2,783,639 to C. C. Lienau, E. Orange N. J., and J. G. Patterson Jr., Falls Church, Va., 5 No. 2,813,931 to Lee DeForest Los Angeles, 6 No. 2,799,452 to Carl Busch, Chicago, 7 No. 2,816,369 to W. F. Becker, White Horse, Jackson Twp., 8 No. 2,715,301 to Edward Grunwald NYC, 9 No. 2,820,290 to J. D. Potter Jr., 272 Central St., Rockland, Mass.
 Copies of patents may be ordered, by number, from the Commissioner of Patents, Washington 25 D.C., at 25 cents each. To write to an inventor, if the address given above is insufficient, you may address him (by name and patent number) in care of the Commissioner of Patents.

How to Drill Big Holes

Home
and
Shop

By R. J. De Cristoforo
and J. L. Hamar

TO DAY'S tool manufacturers offer you an exciting variety of bits and cutters especially designed for drilling large holes. They range from the familiar hand-cranked expansive bit to cup-shaped hole saws that whiz through hardwood with the ease of a cookie cutter. Each has its own advantages and limitations. These may make the difference between an easy, neat and safe cutting operation and one that is troublesome and dangerous.

Hand and power bits differ. All hand-turned bits, including the expansive type, have a screw point that provides the feed power. The angle, or "lead," of the screw draws the bit into the wood at a rate more or less synchronized with the slow speed you apply to the brace handle. Power-tool bits, on the other hand, do not have threaded points. The drill supplies the r.p.m.; you regulate the feed with pressure.

Not realizing this, many power-drill owners get into trouble by chucking a drill designed for hand cranking in a drill

press or portable electric drill. Rotating at high speed, the screw point embeds itself in the work almost instantly, binds, and turns the part into a flaying knuckle buster. It should have been clamped, of course. But even then the screw would have jammed the cutter and stalled the motor.

There's a way around this problem for the drill-press owner. Clamp the work to the table with a thick piece of scrap below it. Then with a metal drill, bore a pilot hole through both, just larger than the fullest diameter of the screw point. Keeping the stock in the same table position, you can now drill the full-size hole without danger of grabbing. With an expansive bit, you'll do even better by filing the threads off the screw point (the removable cutter makes this possible).

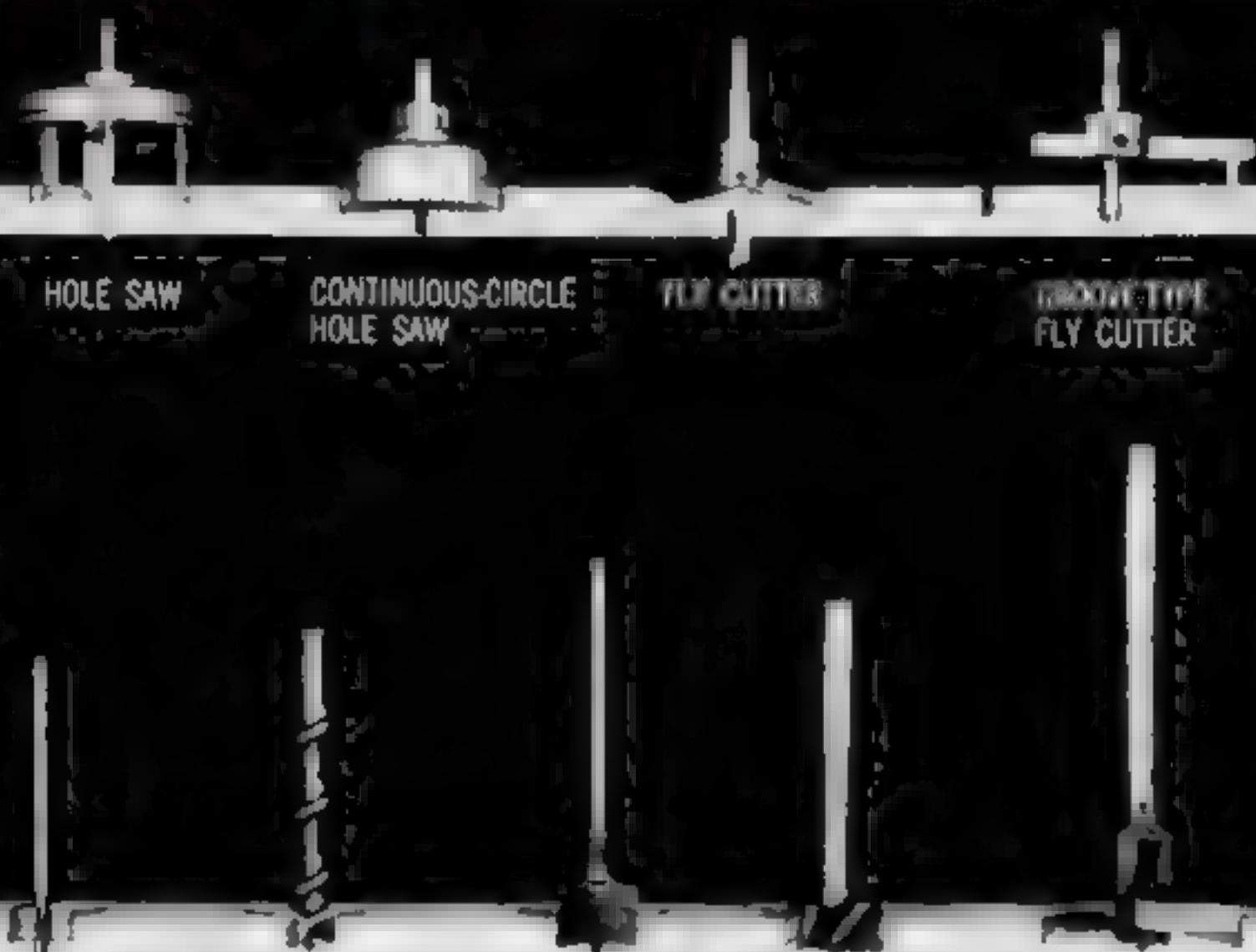
Avoid overloading. You risk burning out power equipment by overloading it. Unfortunately for the owners of $\frac{1}{4}$ " portable drills, there are bits with turned-down shanks that may fit their chucks but require more torque than the motor can supply. Think twice before you use them. If you can't baby one of these bits through stock without excessive jamming,

9 Hole-Cutting Tools for Power Drills

TYPE	DIAMETER OF HOLE	APPROX DEPTH OF CUT	MATERIAL CUTTED	APPROX COST
Hole saw*	adjustable to 2 $\frac{1}{2}$ "	1 $\frac{1}{2}$ "	wood plastics metal cutting blades a.s.o 2 $\frac{1}{2}$ " abe	\$6.00
Continuous-circle hole saw*	nonadjustable sizes to 2 $\frac{1}{2}$ "	3 $\frac{1}{2}$ "	wood plastics metal	\$2.50 arbor 90 2 $\frac{1}{2}$ "
Fly cutter*	adjustable to 3"	2"	wood metal	\$4.50
Groove-type fly cutter**	adjustable to 6"	1"	wood plastics nonferrous metals	\$5.50
Machine bit*** (drills center hole and counterbore)	nonadjustable collar sizes to 1"	5"	wood	\$2.00 1" size, without drill
Solid-center bit set***	1 $\frac{1}{4}$ " to 3 $\frac{1}{4}$ "	4"	wood	\$6.00 (per set)
Interchangeable flat-blade bit set***	2 $\frac{1}{2}$ " to 11 $\frac{1}{4}$ "	5"	wood	\$3.50 (per set)
Multi-spur bit***	nonadjustable sizes to 3"	5"	wood	\$24.00 (3" size)
Modified expansive bit**	adjustable to 3"	5"	wood	\$7.00

*Use in drill press, or portable drill if sufficiently powered **Use in drill press only

***Equally good in drill press or portable drill



MACHINE BIT • SOLID-CENTER BIT

INTERCHANGEABLE

FLAT-BLADE BIT

MULTI-SPUR BIT

MODIFIED

EXPANSIVE BIT



Hand-cranked expansive bit uses your muscle power

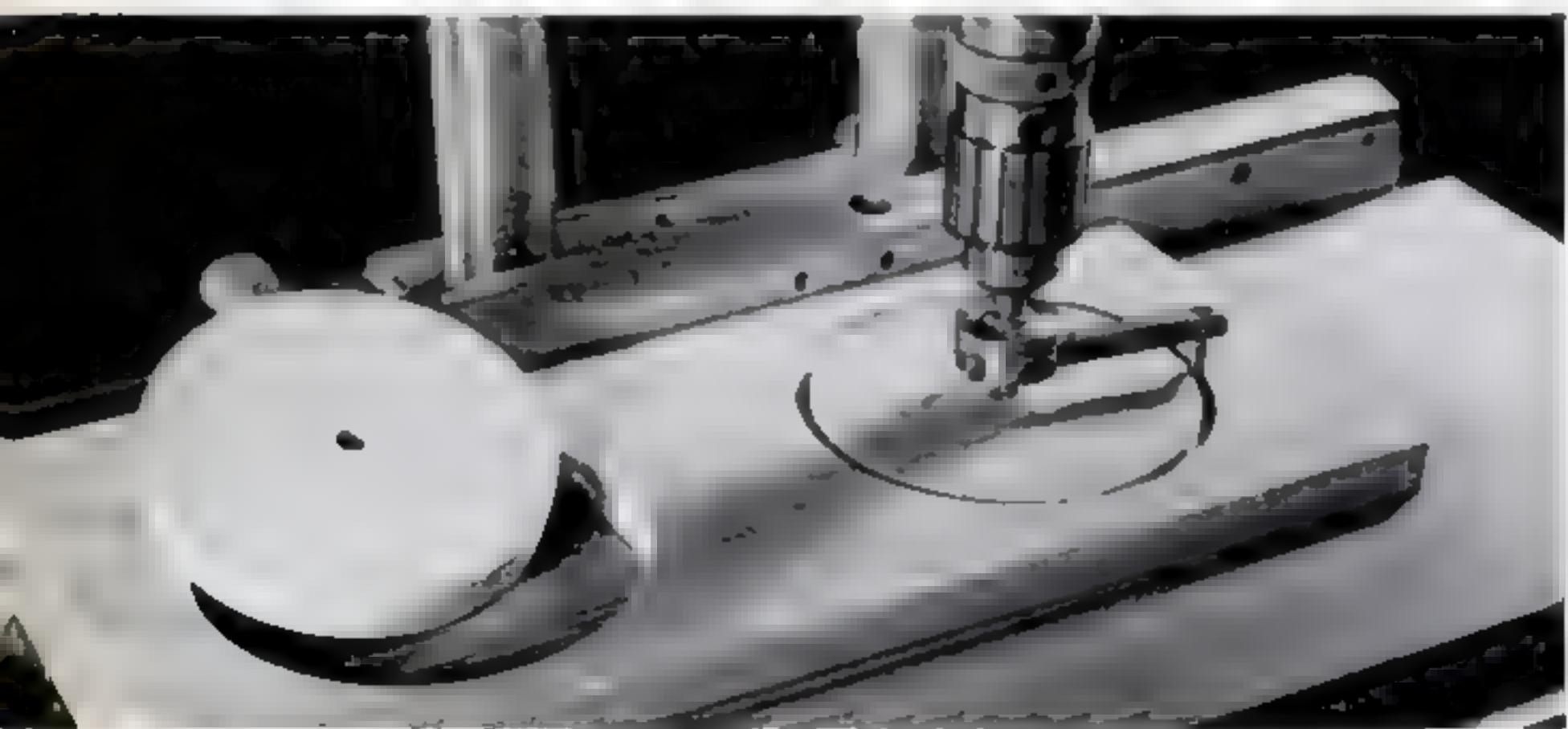
"STRONG-ARM" METHOD OF DRILLING BIG HOLES: The cutting blade of the expansive bit is set at the right radius and a screw point provides the

power feed—all you do is supply the r.p.m. Backing the part in a vise with waste stock insures that you get a clean breakthrough.

This fly cutter gives you an inside dividend

GROOVE-TYPE FLY CUTTER has an adjustable, horizontal arm with a vertical cutter at the outer end. Working like a circular dado, it

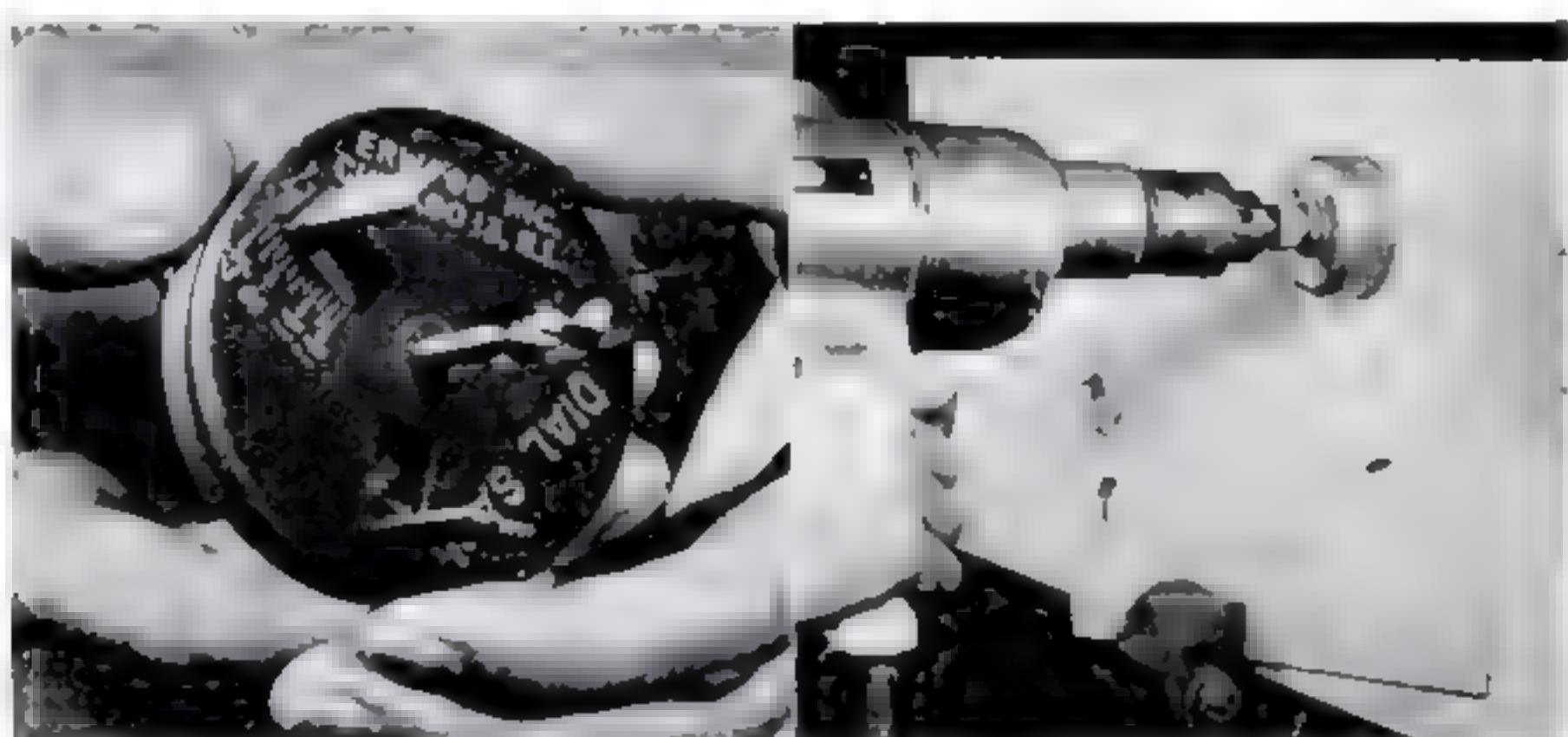
offers, as a bonus, clean-edged center disks with diameters to $5\frac{1}{2}$ ". All fly cutters must be run at slow speed, with light pressure.





EXPANSIVE BIT IS MODIFIED for use in a drill press by sawing off the squared top section and removing the threads from the screw point by holding them against a file as shown, while running the bit at slow speed. The smooth point prevents dangerous grabbing.

BACK STOCK WITH THICK SCRAP, and clamp both to the table, when using a one-sided cutter. Butting the wood against a guide is further insurance against shifting. Start with slow speed and light feed pressure. Increase both until the bit is cutting steadily and smoothly.

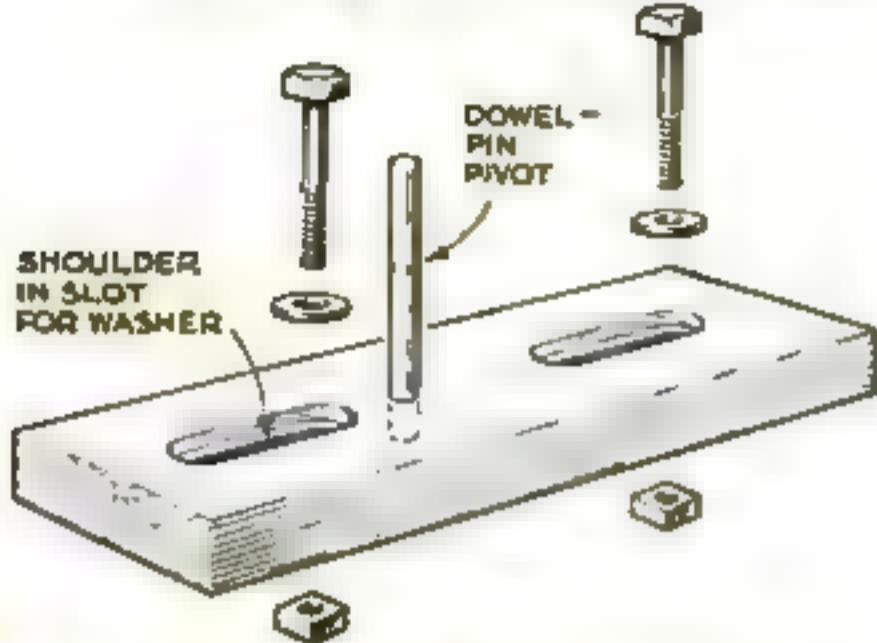


Hole saws trade depth of cut for speed and convenience

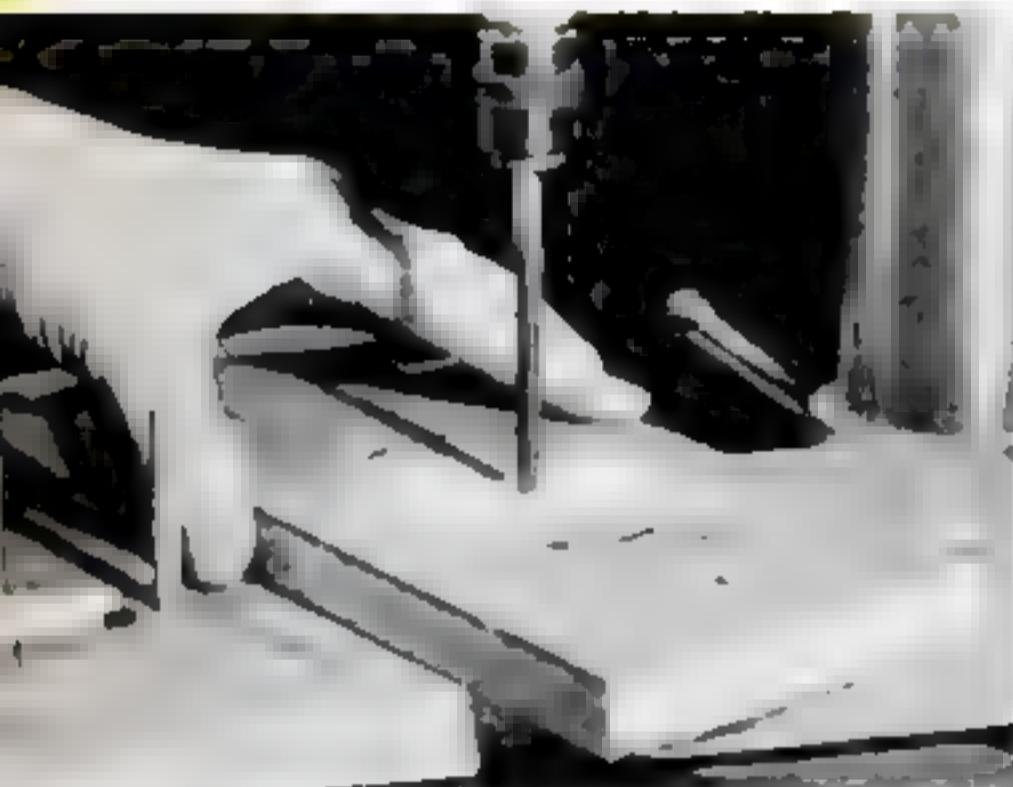
FOR HOLES TO 2½" DIAMETER, hole saws offer the smooth and fast-turning characteristics of multicutting blades or continuous saw teeth. Adjustable model at left (you turn the upper disk to get the right setting) can be fitted with

either wood- or metal-cutting blades. The cup-shaped type (right) requires a different saw for each hole diameter. All saws are attached to the same arbor. Heavy-duty portable drills will handle either type of hole saw.

No cutting tool large enough? Then use this trick

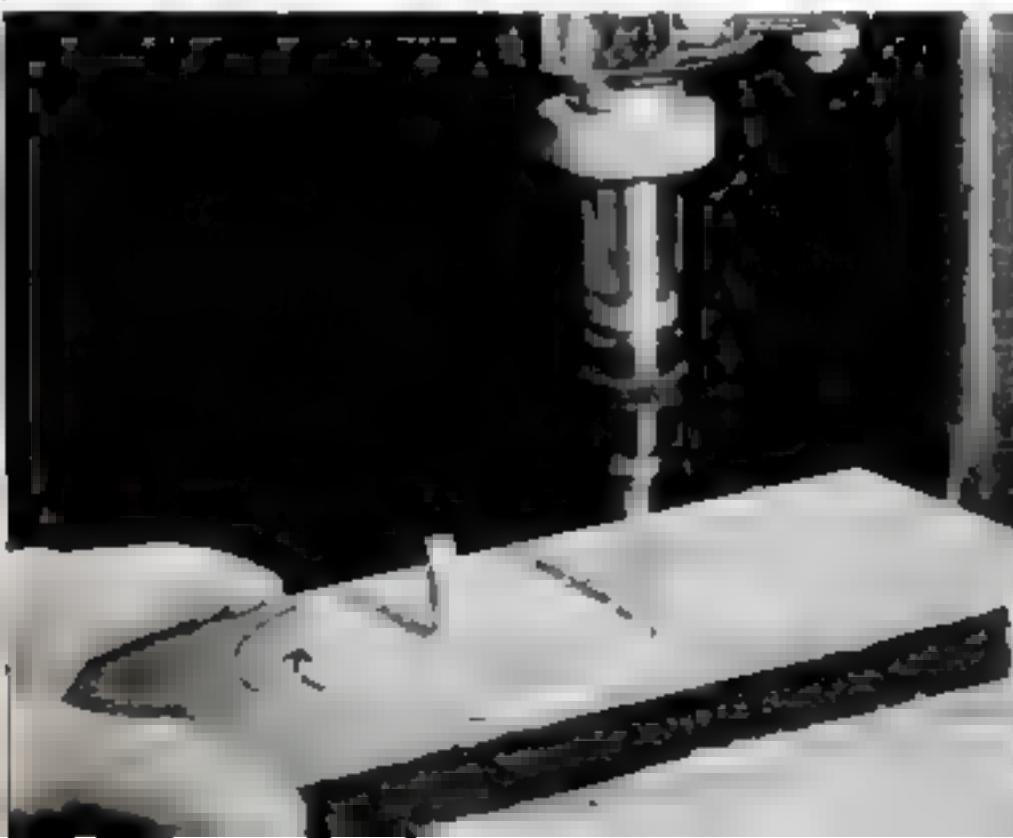


ADJUSTABLE JIG., made from a board and dowel pin, lets you cut holes and disks limited only by spindle-to-post clearance of drill press. A $\frac{1}{4}$ " router bit makes cut.



MARK A CIRCLE of the desired size on the stock and drill a hole through its center, using a bit of the same diameter as the dowel pin. Then place the bit in a collet chuck.

WITH STOCK ON THE PIN, bolt the jig to the table and drill a hole through the circle's edge. Raise the bit for a $\frac{1}{8}$ "-deep cut, lock the spindle, and rotate the work clockwise.



accept the fact that you are under-powered, and use a hand brace

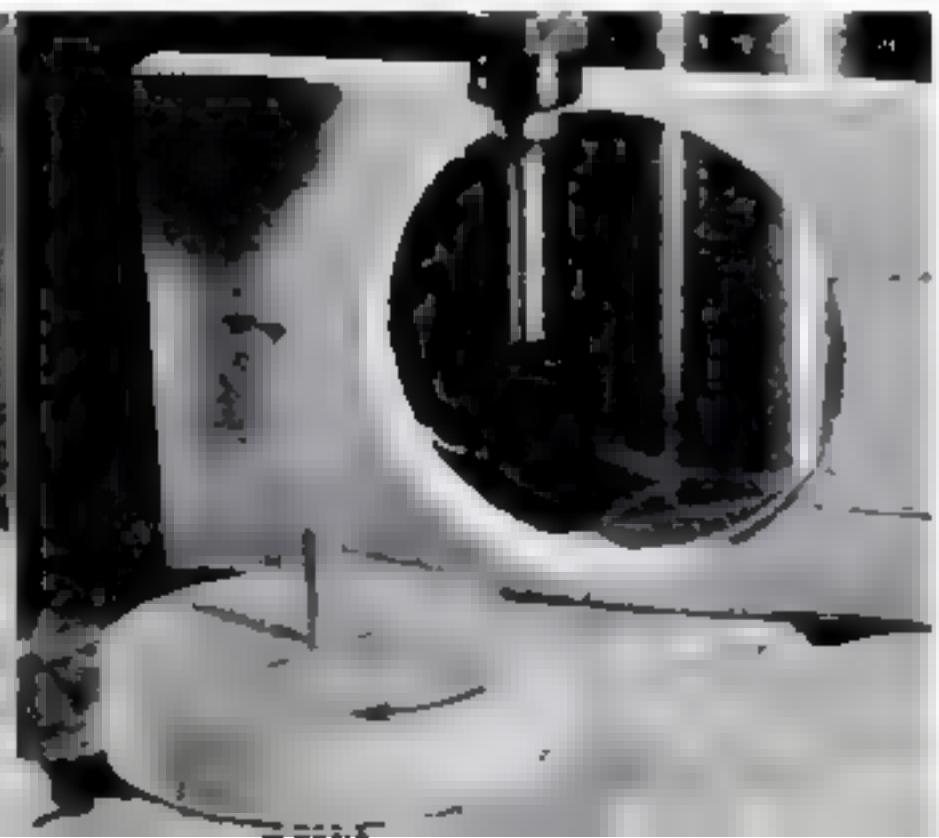
Drill-press rules. It's good practice, with most drill-press work, to clamp the stock securely to the table. Make it a must when boring any hole larger than $\frac{1}{2}$ ". Bear in mind that the speed and power of the driving unit—and this goes for portable drills, too—fluence the performance of the cutting tool

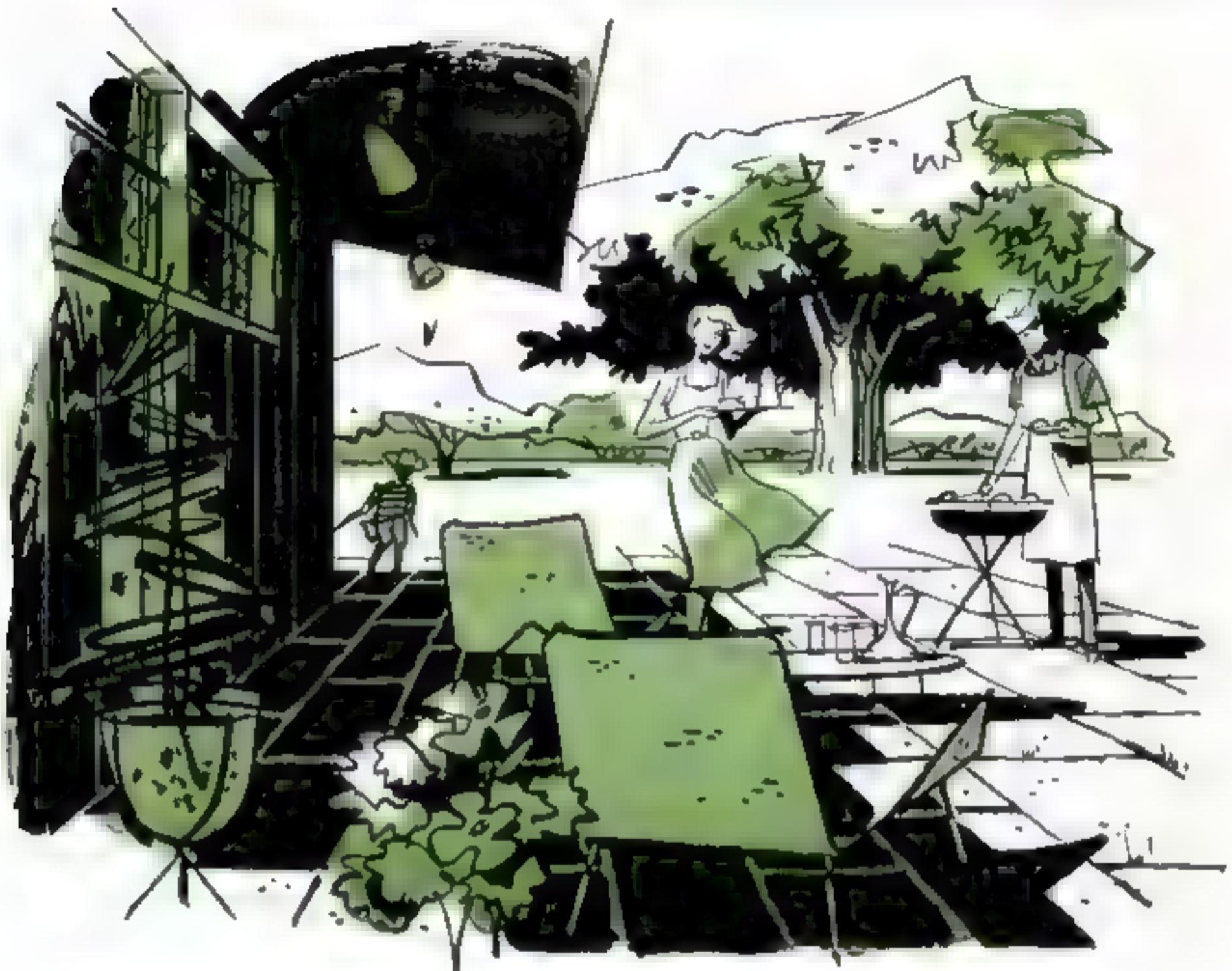
More power and less speed are required for large holes than small ones. When drilling any hole over $\frac{1}{2}$ ", start at the slowest driving speed, regardless of the bit or cutter you use. Increase the speed gradually to a point where the tool is cutting continuously and cleanly, without smoking, under moderate quill pressure. You can keep comfortably close, on a drill press, by belt changing. With a portable you can't. You'll have to control the feed pressure, instead

Using hole cutters. These tools have larger capacities than conventional bits and are divided into two categories—one-sided cutters (the fly type), and multiple cutters, such as hole saws, spur bits and double-spur bits. The first are more likely to dig in and jam if you try to make them cut too much by forcing the feed. Generally they are not well adapted for use in portable drills because they must be backed with plenty of torque to core out large areas.

Your best bet for drilling big holes with a portable drill is a multiple cutter—preferably a rotary saw, which removes a minimum of material.

MAKE SUCCESSIVELY DEEPER CUTS until the coring operation is complete. If you want to make a disk with this method, set up the jig so the bit cuts outside the guide line. **END**





***Planning to build? Nature can give you a
moneysaving answer to this big question:***

Which Direction Should Your New House Face?

By John L. Springer

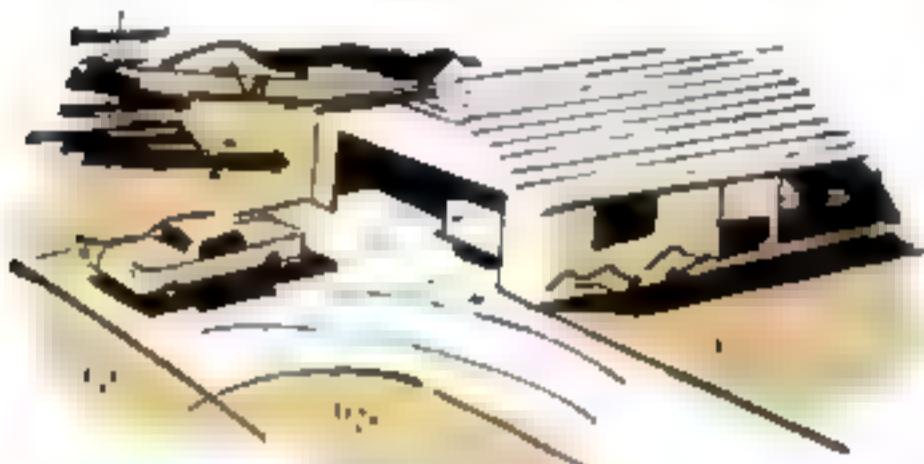
HOW you mate your new house to the building lot is a decision that hits right at the pocketbook. Bad judgment can cost you a few thousand unnecessary dollars both in immediate construction and in a succession of heating, lighting and cooling bills that you will have to pay through the seasons.

You can save those thousands. Put nature to work. Most of the day the sun is in the south. In the early morning it shines in the east; in late afternoon in the

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Next month: 10 Common Mistakes in Planning a House are discussed by architects. They tell you how to recognize and avoid building blunders that can cost you money and cause unhappy afterthoughts.

Use nature's aids to make your house a better home

Take a look at the land you're planning to build on. It may offer many ways of cutting construction costs and creating better living for yourself and your family—if you know how to take advantage of them. Here's a checklist that will help you—and nature—plan your home.



Beware of ambitious driveways. A side approach needs extra paving at the turn.

west. In summer it's mostly high overhead; in winter, usually low-hanging. In most parts of the United States, prevailing winds come from the west and north. Your cue is to turn these facts of nature to your own advantage by the way you position the house on the lot.

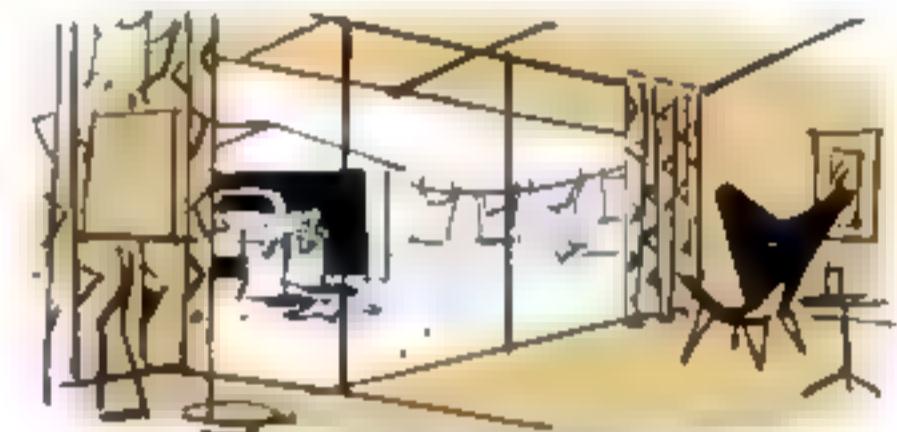
It is not generally realized that most communities will allow you to turn a house any way you please. Of course, zoning laws require it to be a certain distance from the street, and from the sides and rear line of the lot. But you usually can locate the house at an angle, turn it so its side faces the street, and even put the entrance at the back.

Heating. If you place your house so most of your big windows face north or west, your furnace will work overtime to offset those frigid winds. That's because glass—even double-layer glass with an insulation space between—does not keep out the cold as well as a solid wall. An east window lets the sun in only early in the morning. The rest of the day it leaks house heat to the outdoors.

But if you put your big windows on the south, they will be on the protected side—away from the prevailing cold winds—and they also will let the sun in to do a heating job in winter. In fact, the sun's



Winter sun riding low in the south can help heat your house if you invite it in.



Place picture window not only for sun, but to have a view you won't get tired of.

heat alone could warm your house on clear, cold days. Tests have proved that in all but the coldest sections of the country—up near the Canadian border—windows on the south let in more heat on sunny days in winter than they let out. And you can cut your heating bills further by covering windows with heavy drapes. Open them in the morning to let light and sun in, close them at night to hold the warmth.

Cooling. During the summer the trick is to keep out the sun you've been inviting in through your south windows all winter. Otherwise your home will be a hothouse—or you'll need a big cooling plant and plenty of costly electricity to keep it comfortable.

Since the summer sun is high in the heavens, a wide roof overhang will shade the windows and keep you cooler. The overhang won't keep out your free heat in winter, because then the sun shoots in at a lower angle.

If there are big trees on your lot and you can place the house east of them, they'll be a cooling barrier between you and the sun. As the sun sinks on summer afternoons, aiming its rays almost on a horizontal line through your western windows, even roof overhangs don't help



Roof overhang shades high summer sun. Trees help. Louvers let in cool breezes.



A house that uses a slope will eliminate costly earth-moving; retaining walls.

much. But trees in full leaf create shade that will keep an air-conditioner snoozing during hot spells. Then, come autumn, the trees shed their leaves, just when you want all the help the sun can give.

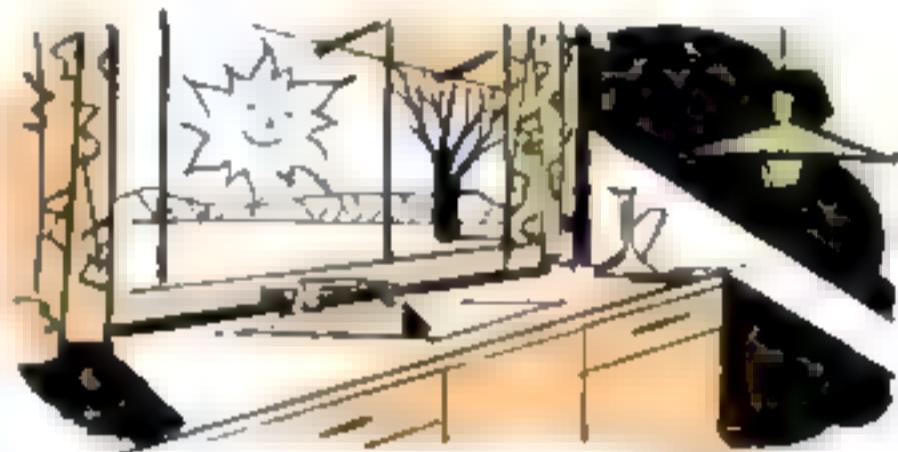
If you can locate your house so its roof is shaded by trees too, extra summer cooling is the bonus. Since heat rises, the cooler your attic the more likely that warm air from below will rise into it, lowering the mercury downstairs.

In summer, too, you'd like to take advantage of breezes from the north. But say you've placed the house so that few or no windows face north, with winter in mind. How do you get those summer breezes? One way: Put oversize louvers in the north and west walls of the attic. Open the louvers all the way in summer for an attic "airwash" that will help cool the rooms below. In winter, close the louvers, but make sure the attic has enough air circulation to prevent winter condensation.

Air-conditioning engineers take locations of windows and trees into consideration when deciding how big a cooling plant should be. Letting nature help cool a house, they say, saves both on the cost of the original equipment and the cost of operating it, year after year.



Ditch-digging is expensive. Locating near well, water main, sewer saves money.



A southern-exposure kitchen will get free sunlight, cutting down electric bills.

Lighting. You don't need a flood of natural light in your bedrooms. Most families don't use their living room a great deal by day, either. But the kitchen, laundry area and dinette can use daylight as long as the sun will provide it. You can save on utility bills by putting these rooms on the south side where the sun will give them extra hours of free light.

Lower construction bills can result, too, from the way you set the house. Here are examples:

- **Plumbing.** In estimating the cost of water-supply and waste-disposal lines, plumbers figure the length of pipe run from the well or main water line and the sewer to your house. On a big lot, a few hundred dollars may be saved by building close to the main lines to eliminate long pipe runs. Even on an ordinary lot, you can save if all the water-consuming rooms—kitchen, bathroom, laundry—are on the side nearest the sewer.

- **Driveway.** With paving costs anywhere from 25 to 50 cents a square foot, the length of your driveway should be reckoned when you consider where you'll put the carport or garage. Obviously, the nearer the street the lower the cost. This is more of a factor if you have a big lot.

3 ways nature can help you save money

- 1.** By letting the sun and winds coddle you, chopping sizable chunks off your bills for heating, lighting and cooling throughout the seasons.
- 2.** By locating the house—with due respect to local zoning rules, which you'll want to check—as close as possible to water source and sewage lines.
- 3.** By selecting your house design to fit the land, reducing the need for excessive earth-moving, for retaining walls and other money-gobbling projects.

instead of the usual suburban subdivision where most garages are the same distance from the street. Even so, a side approach, with a paved turn-around area, may easily add \$200 to the cost.

• **Terrace or patio.** How you locate these will determine whether you need an expensive roof to block the sun and keep you cool on hot days, or whether you let your house furnish the shade. The best patio location for both comfort and low cost is the north, where it will be in the house shadows most of the day and will be swept by cool northern breezes.

• **Retaining walls.** On some lots, if you put the house one way, a high wall is needed to separate the driveway from the lawn at a higher level; put the house the other way, and the lawn and driveway come together naturally. Figure a retaining wall at a dollar or more a square foot, and you'll agree that this could be an expensive item.

• **Earth-moving.** Here's another consideration. Houses built on concrete slabs need a level surface on which to lay the floor. If it does not already exist, dirt must be added or taken away. Split-level houses and houses with partially excavated basements require a ground surface that's higher in one part of the lot than the other. If the natural slope isn't there, or if you don't take advantage of it, hundreds of yards of earth may have to be moved. With bulldozer operators collecting up to \$100 a day, that dirt's not cheap.

• **Clearing trees.** On a heavily wooded lot you can easily spend hundreds of dollars to cut down and cart away tall trees. Remember that trees shade the summer sun and deflect winter winds. Save as

many as you can—why plant others after the house is built?

Plan or land—which comes first if you want the best possible combination of house and lot? There has always been an argument about this, and like the chicken-or-the-egg controversy, it has two sides.

Before World War II, standard advice was to choose your house plan, then find a suitable lot. But since the postwar building boom used up most of the good plots in many parts of the country, lot buyers can't be too choosy. Good building plots are harder to find now than good house designs to fit the problem sites that remain.

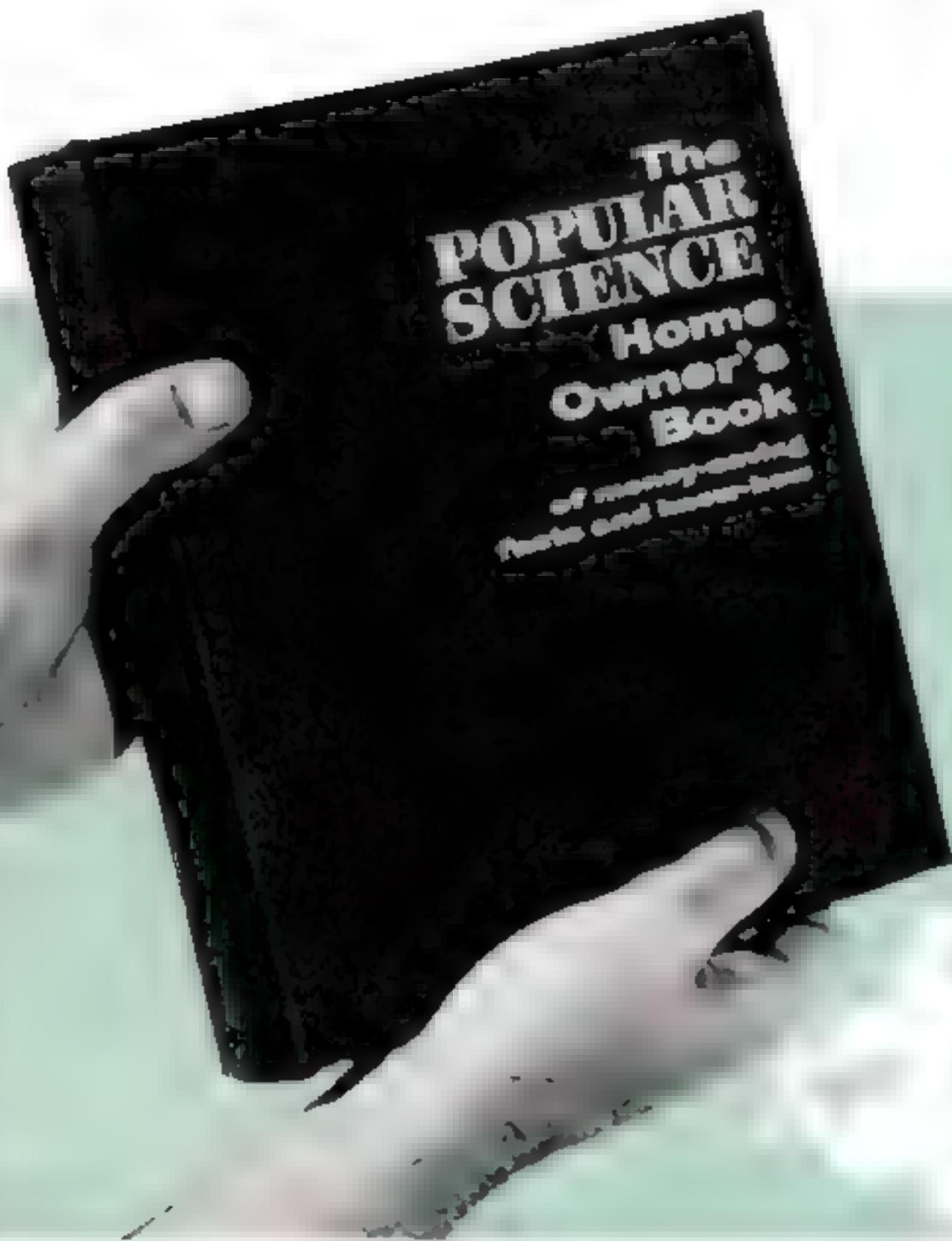
If you go shopping for a lot first, your best bet is one that slopes to the south. You can put big windows in the back of your house, where they'll get heat from the sun and you'll have a view of your own grounds. And, since cool air descends, you'll be in the path of breezes sweeping down from above.

When you try to fit your house to your lot (or vice versa) you probably won't be able to take advantage of all the money-saving opportunities in ideal house placement. You may have to make compromises. Surveys show, for example, that most women prefer a southside kitchen for sun and natural working light. But they also want the kitchen in the rear, so unexpected guests won't see the dirty dishes. If the rear of your lot is on the north, you'll have to choose between saving money and saving face—or buy an automatic dishwasher.

Even some of these ideas, however, can build more comfort into your home—at savings in the long run that may almost pay for the lot itself.

END

Now, Make Your Own Book of Home Repairs



Big new
service
section
on next
8 pages

- know-how file
- fix-it file
- materials file

FACED with an unexpected job around the house, all of us sometimes think: "I read something about that once—wish I could lay my hands on it."

From now on, you can.

Three departments in this issue of **POPULAR SCIENCE** (they'll appear every month hereafter) provide facts you need—in a form easy to tear out and save until you need them:

The *Fix-it File* each month will tell how to handle a particular repair or maintenance operation.

The *Know-How File* will show in pic-

tures and words some specific technique useful in a variety of jobs.

The *Materials File* will report on items and equipment you may need tomorrow—or two years from now.

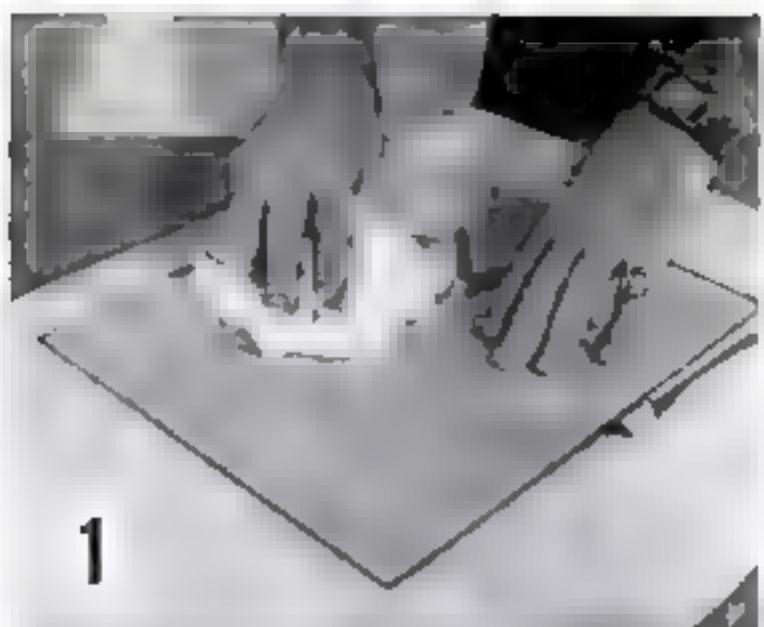
Save your guides in any looseleaf binder you have on hand.

Or you can get the special binder shown above, postage paid, by sending \$2.50 and your name and address to:

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Dept. B-758
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know-how file

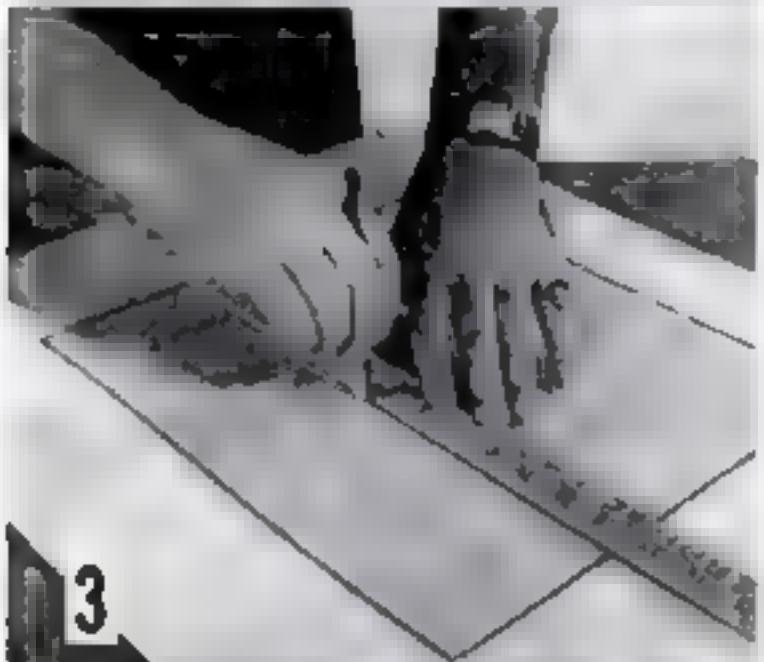
Cutting Glass Like an Expert



1



2



3



4

CUTTING glass is as easy as it looks if you follow the rules. You don't have to make a deep cut; a fine line will do. The sound of tearing silk as you make the cut is a sign that all's well.

You need a sharp cutter, of course, and a flat work surface. Rest the glass on layers of newspaper, felt or perhaps a blotter. Wipe away all dirt and grit (Photo 1 at left) that might dull the cutter or cause an imperfect cut, then lubricate the cutter wheel (2) with household oil, blotting off the excess. A free-running wheel stays sharp longer and won't jam or skip. Guide the cut with a wooden yardstick (3), dampening the underside or applying masking tape to keep it from slipping on the glass. Grip the cutter between the first and second fingers, with the thumb on the underside, and be sure to hold it vertically, never at an angle. Lower the cutter to the glass just short of the far edge and draw it toward you with an easy, continuous stroke. Use gentle but firm pressure. Never go over a cut twice.

Holding the glass firmly on both sides of the cut (4), break it with a quick down-bend motion. Some workers first gently tap the underside of the cut with the handle end of the cutter to crack the glass. Use the slots in the cutter to break off narrow strips (5). If a strip does not break cleanly, use the slots to nibble off short pieces. Practice on scrap glass.

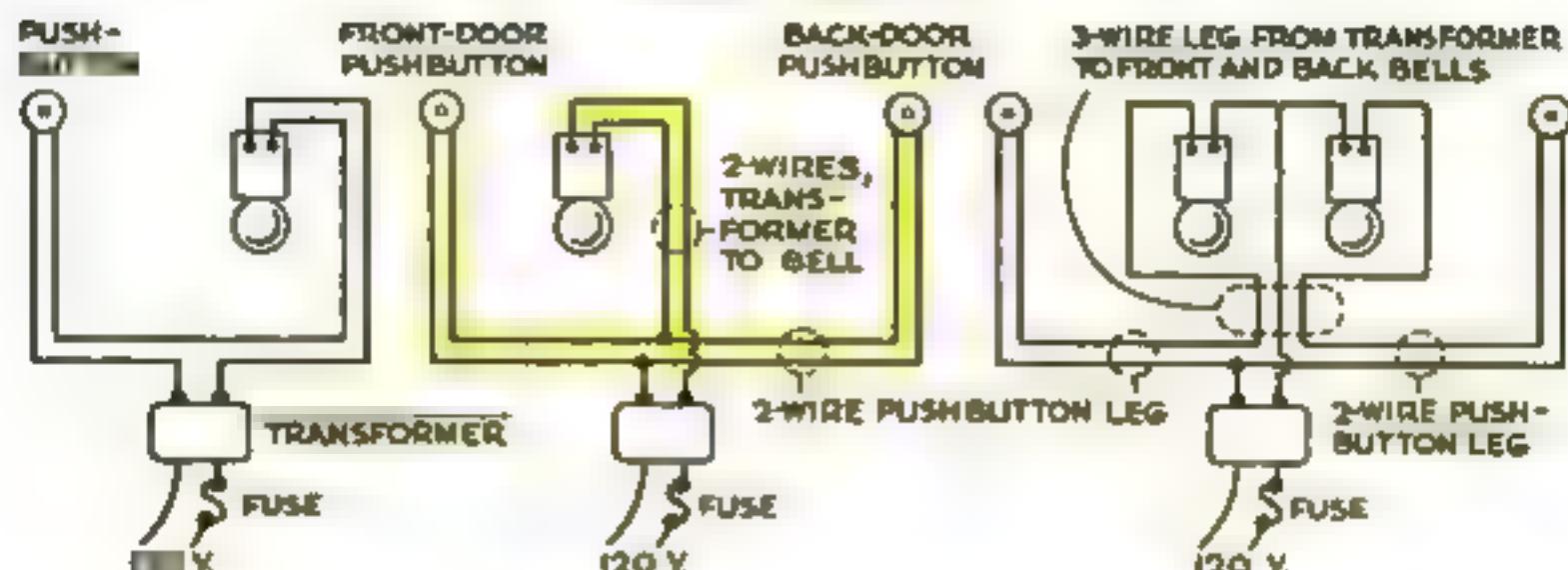
If glass edges will be exposed in use, it's customary to smooth them on a wet grindstone. Lacking that, rub them on an oilstone soaked in water.



5

Doorbells and Chimes

BELL CIRCUITS



THE CIRCUIT for your doorbell or chimes is probably among the three typical ones sketched above. To troubleshoot your circuit you'll find the test equipment at the right helpful—a test lamp and a jumper wire. The test lamp is a series-type Christmas-tree bulb and socket; the jumper wire is a piece of insulated wire with safety pins soldered on its ends to serve as contacts.



Symptom	Probable cause	To find trouble
Bell dead	Pushbutton faulty	Short across button terminals
	Break in wires to pushbutton	Bridge wires with jumper
	Break in wires from transformer to bell	With button shorted, use test lamp at intervals along wire
	Short in circuit between transformer and bell	Make spark test at transformer with button shorted
	Transformer dead (burned out or fuse blown)	Use test lamp at transformer
Bell rings continuously; chime doesn't sound but plunger remains extended	Short in pushbutton leg of circuit	First be sure button isn't stuck. Then disconnect it. Snip wires in ceiling or where they emerge from wall. If short is in wall use old wire to pull through new pair
Poor tone, or bell rings erratically	Dirt in mechanism	Clean with carbon tet or mount with gong down
	Burned points	File or sandpaper points
	Out of adjustment	Bend clapper, adjust chime
	Loose connection	Tighten all screw connections
	Pushbutton contacts dirty	Brighten with sandpaper
Two bell tones are difficult to distinguish	Improper installation	Use solder on one or slit one with hacksaw

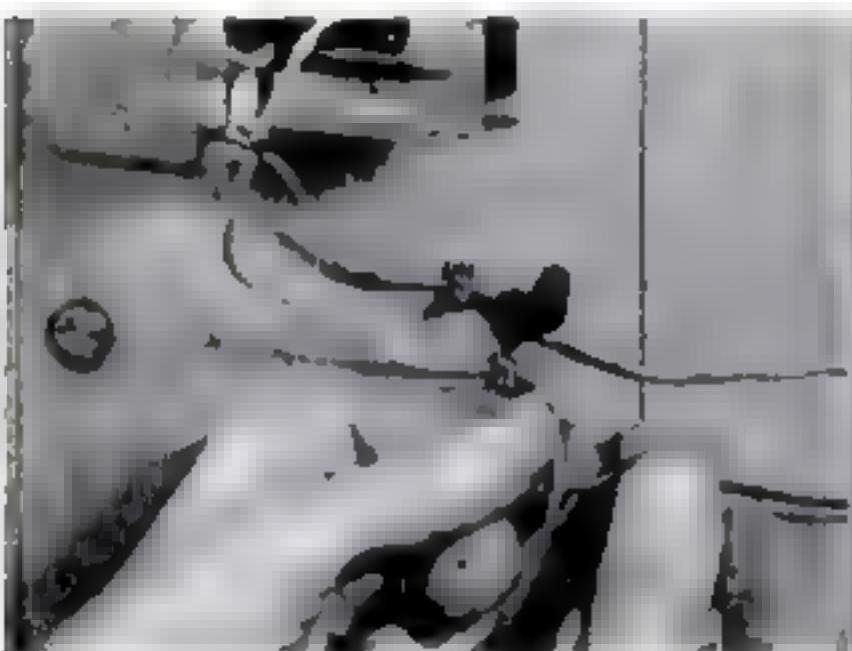
What to do when the bell is dead



CHECK HOUSE FUSE FIRST. If okay, test transformer output by touching its leads with your test lamp. If lamp doesn't light, replace the transformer. Caution: Remove the line fuse before attempting to disconnect the transformer's 120-volt input leads. But if transformer is delivering, next bridge the button terminals with a wire (above left).



If this rings the bell, the button is at fault. If not, check continuity of the button wiring by piercing its insulation at several places with the pin-and-wire jumper (above right). Have someone push the button while you brush together one of the wires leading to the bell (below, left). A spark indicates that there is trouble at the bell.



Cleaning and adjusting bells and chimes



RUB FINE SANDPAPER between contact points to brighten them, then remove grit with a folded cloth. Bend clapper arm (center) so it strikes gong edge sharply. Mounting a balky bell upside-down will let gravity assist the clapper. Use a stiff brush to re-

move dust from chime mechanism; carbon tet for cooking-grease deposits. To adjust chimes, tap tube to make it vibrate, turn screw until tube touches plunger tip, then advance a quarter-turn more. If you take chimes down, number wires to avoid a mixup.

The Basic Facts on Plastic Tile

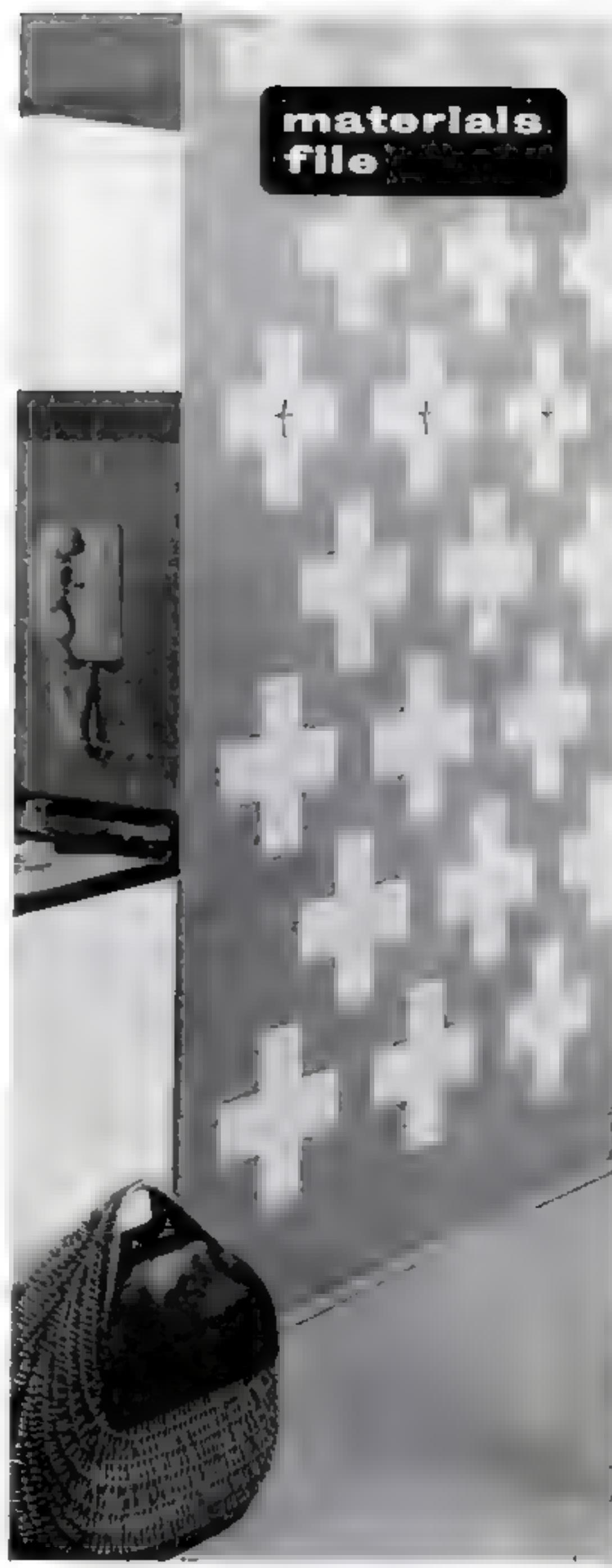
PLASTIC tile offers you a modern way to cover walls. It's easy to install, inexpensive and easily maintained, and it comes in many sizes and shapes.

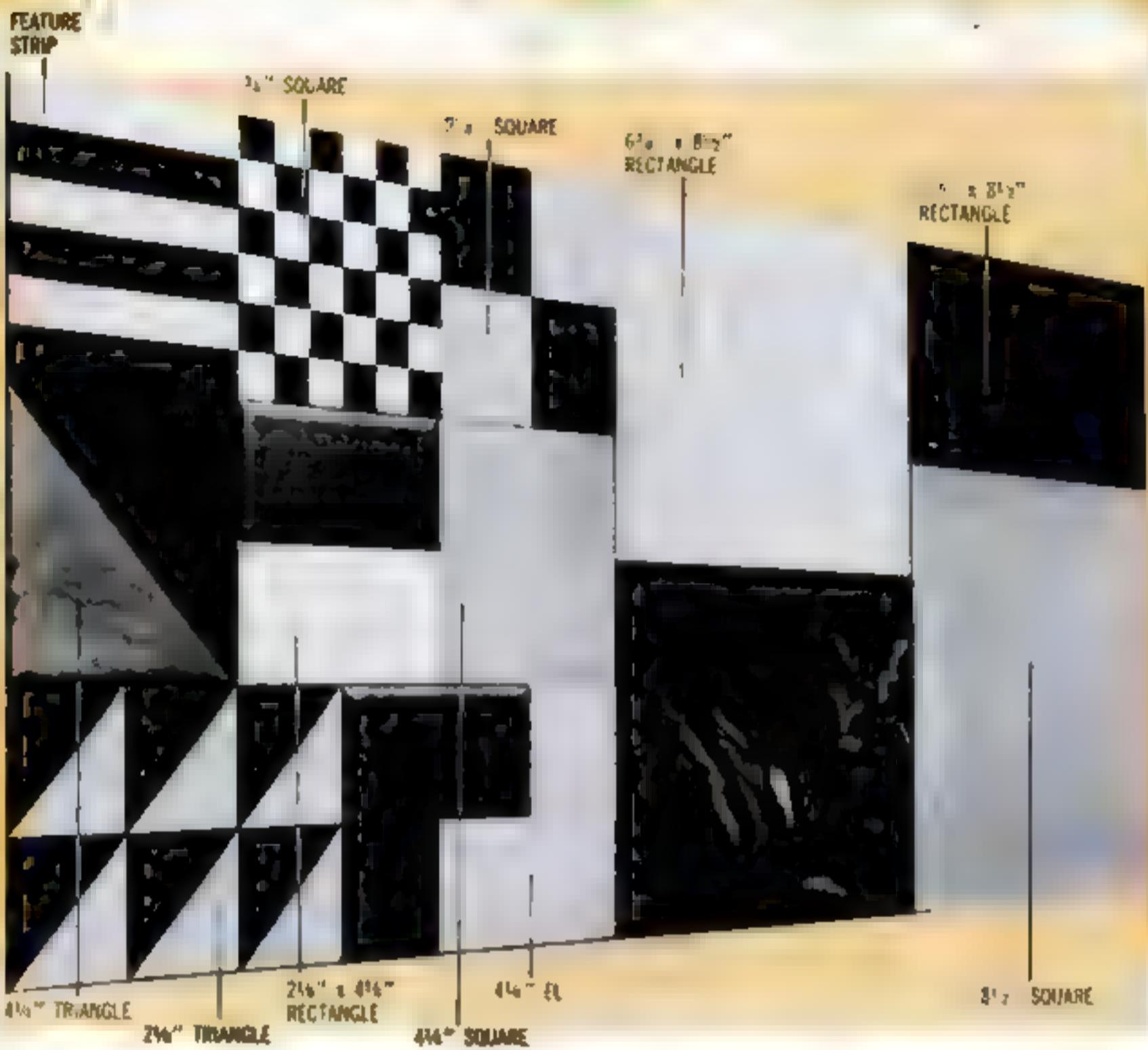
The squares, rectangles, triangles, L shapes, feature strips and trim pieces are all modular. This means that you can mix tiles of many shapes and sizes, yet have them fit together exactly.

Squares, for example, come in four sizes. You could fill an 8½"-square space with a single 8½" tile, four 4¼" tiles, sixteen 2½" tiles or sixty-four 1 1/16" tiles. By combining big and little tiles you can create an infinite variety of designs.

The best-quality plastic tile is slightly thicker than .062"—to comply with an industry standard. But tile

**materials
file**





Plastic tile comes in fit-together sizes

ANY DESIGN IS POSSIBLE with the new modular plastic tile. It comes in squares, rectangles, triangles and "els." Each shape

is made in several sizes, dimensioned so you can mix big squares with small triangles, for example, and have them fit evenly.

only .050" thick can also be had. The lighter tile costs less but is less likely to form an even surface.

At latest count, there are 140 different colors or shades to choose from. In addition to a glossy surface, plastic tile comes with matte, granite-tone, marbleized, or metallic finishes. There are even fluted and quilted surfaces.

Advantages. Plastic tile can no longer be tabbed as the Johnny-come-lately imitator of ceramic tile. Despite a budget price tag, plastic tile has very desirable

qualities—easy cleaning, pure colors and light weight (six ounces per square foot). Most important is the weight. You can tote plastic tile home with you, and any wall or ceiling in the house will safely support it.

Where to use it. You can use plastic tile in the kitchen, laundry, storage room, foyer, halls, children's bedrooms and elsewhere. It's also a favorite choice for boats and mobile homes.

But don't use plastic tile outdoors or near sources of heat—it doesn't weather

You can use decorative plastic tile in any room of the house



KITCHEN



LIVING ROOM



DINING ROOM



DEN



CHILD'S ROOM



LAUNDRY

well and can't take temperatures over 180 degrees. You can substitute metal tile (stainless steel, copper or aluminum) near radiators, counter-top burners or within three inches of light bulbs.

Heavy wear, abrasion and certain chemicals harm plastic tile, too. It will stand up under a direct hammer blow, but can be scratched quite easily. (In areas subject to damage from banging doors or kicks, as in the bottom row where wall meets floor, many pros use cove tile of rubber or an abrasion-resistant plastic.) Solvents such as turpentine, kerosene, nail-polish remover or oil paint will mar the finish.

What does it cost? You can buy some plastic tile for 35 cents a square foot or more, or pay as little as half that much. A special vinyl-plastic tile that looks like real marble runs as high as \$1.25 a square foot—but this is a luxury item to be used sparingly.

Quality causes the price difference in tile as in other materials. The best is made from virgin plastic pellets and costs at least 25 cents a square foot. Bypass cheap tile made from reprocessed scrap.

Buying tips. Price is a good guide for separating quality tile from cheap. But to make sure you get only the best, you should make these checks:

- Look for a seal or statement on the tile or package indicating conformance with commercial standard CS 168-50, U.S. Bureau of Standards. (Lack of a seal, however, doesn't necessarily indicate poor quality.)

- Feel the edges of the tile. They should be squared off somewhat, rather than knife-edged. Thin tile cracks easily and slips behind adjoining tile when you try to install it.

- Hold the tile to the light. If you can see your fingers clearly through the plastic, you will be able to see trowel marks too. Almost no light should come through.

- Examine the tile surface for scratches, fingermarks and embedded dirt. These indicate inferior plastic. When you buy tile, get some extras for possible use later. These matching replacements will come in handy in case you break an installed tile or move some fixture like a towel bar or light outlet.

(Replacing a damaged tile is simple, by the way. You punch a screwdriver or ice pick through the center, pull off the tile

and replace with a new one. Butter it first with mastic adhesive.)

Tips on applying tile. You can apply tile to any wall or ceiling that is smooth, dry and solidly built. Plaster, plywood, brick or concrete and any kind of wallboard will support it.

If a wall gives when you press on it you will have to do some reinforcing to make it rigid. High or low spots will need sanding or filling. Wallpaper and poorly bonded (or water-soluble) paint should be removed. Bad plaster must be patched with new plaster or plasterboard. And take down all removable fixtures.

Moisture is an enemy of any tile, plastic or ceramic. When vapor gets behind tile and condenses there, it rots the wall; eventually the tile fails, too. To prevent this, a waterproofing compound made for the purpose should be applied to the wall around bathtubs, wash basins, in shower stalls and laundry rooms.

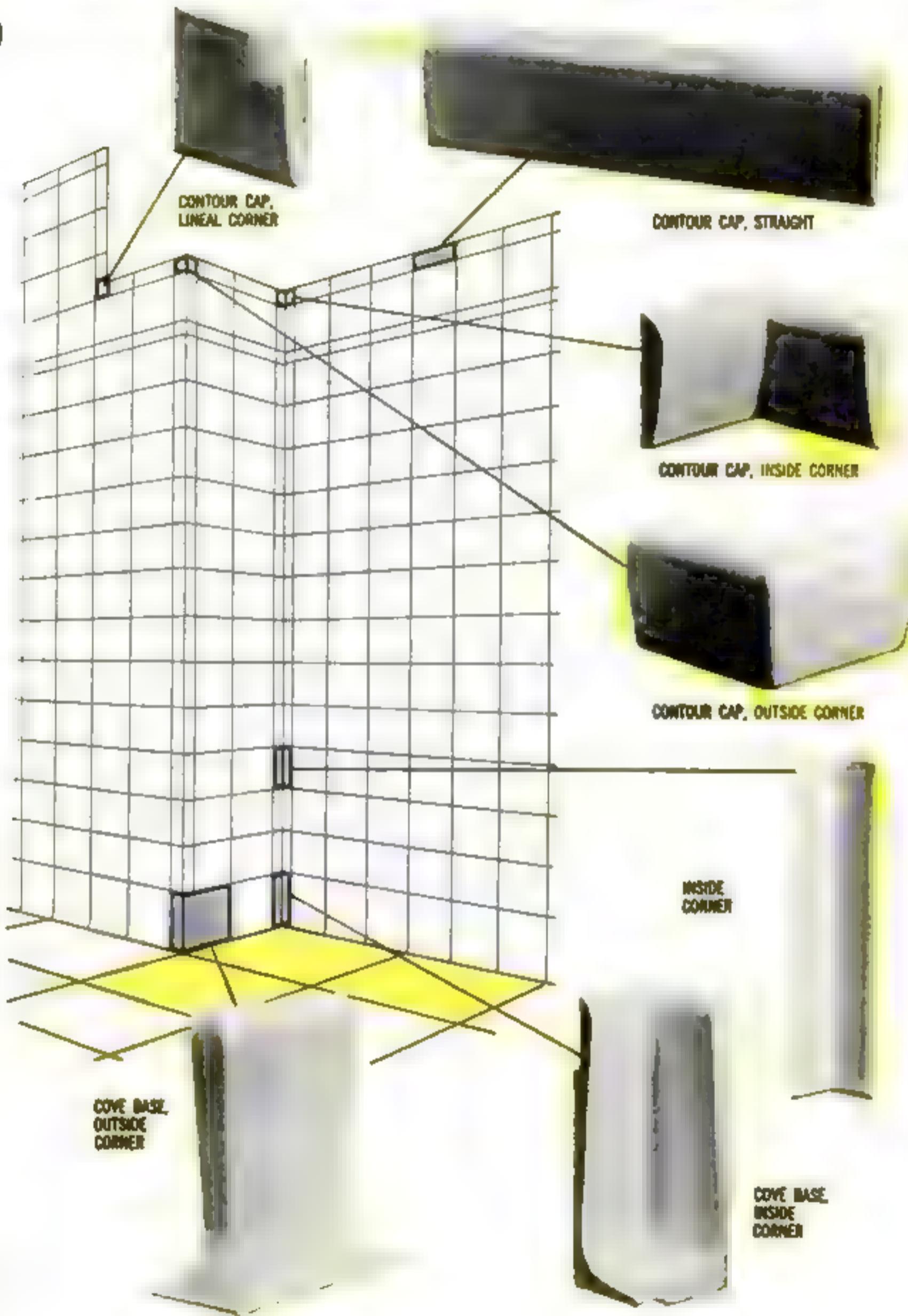
Tile the ceiling before you tile adjacent walls. You can use the same method as for floor tile: Draw two guide lines at right angles to each other, intersecting in the center of the ceiling. Then begin tiling from the center and work outward, cutting the border tiles to make them fit. Ceiling tiles installed on a diagonal are especially attractive.

Besides tile you will need adhesive, a special trowel to spread it and a fine-toothed saw or a tile cutter. Mastic adhesive commonly comes in gallon cans that cost about \$3.50 and cover roughly 40 square feet. The trowel should have notches at least $\frac{1}{8}$ " deep and $\frac{1}{4}$ " apart; an average price is \$1. If you don't have a fine-toothed saw or tile cutter better get one—scissors, shears and knives leave nearly invisible hairline cracks that cause trouble later.

You can butt plastic tile if you like. Or, to make them resemble the ceramic kind, you can space them $\frac{1}{8}$ " apart or so and grout between by smoothing adhesive along the joints. At least one plastic-tile company offers "grout strips," slivers of white plastic $\frac{1}{8}$ " wide that can be pressed into joints. Held by the adhesive, they look like even grout lines.

Cleaning plastic tile is best done with a soft cloth dipped in cool water containing a small amount of liquid household detergent. Never use kitchen cleanser, steel wool or other abrasives.

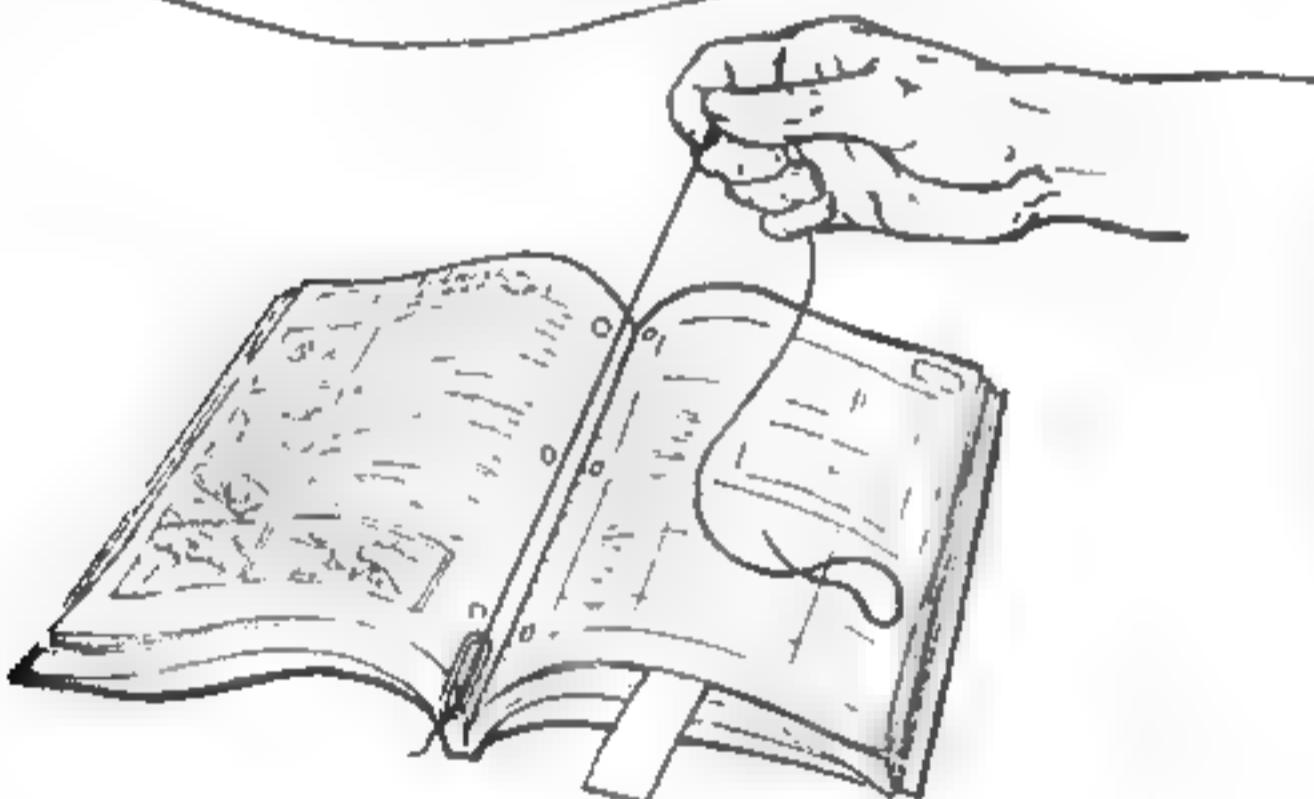
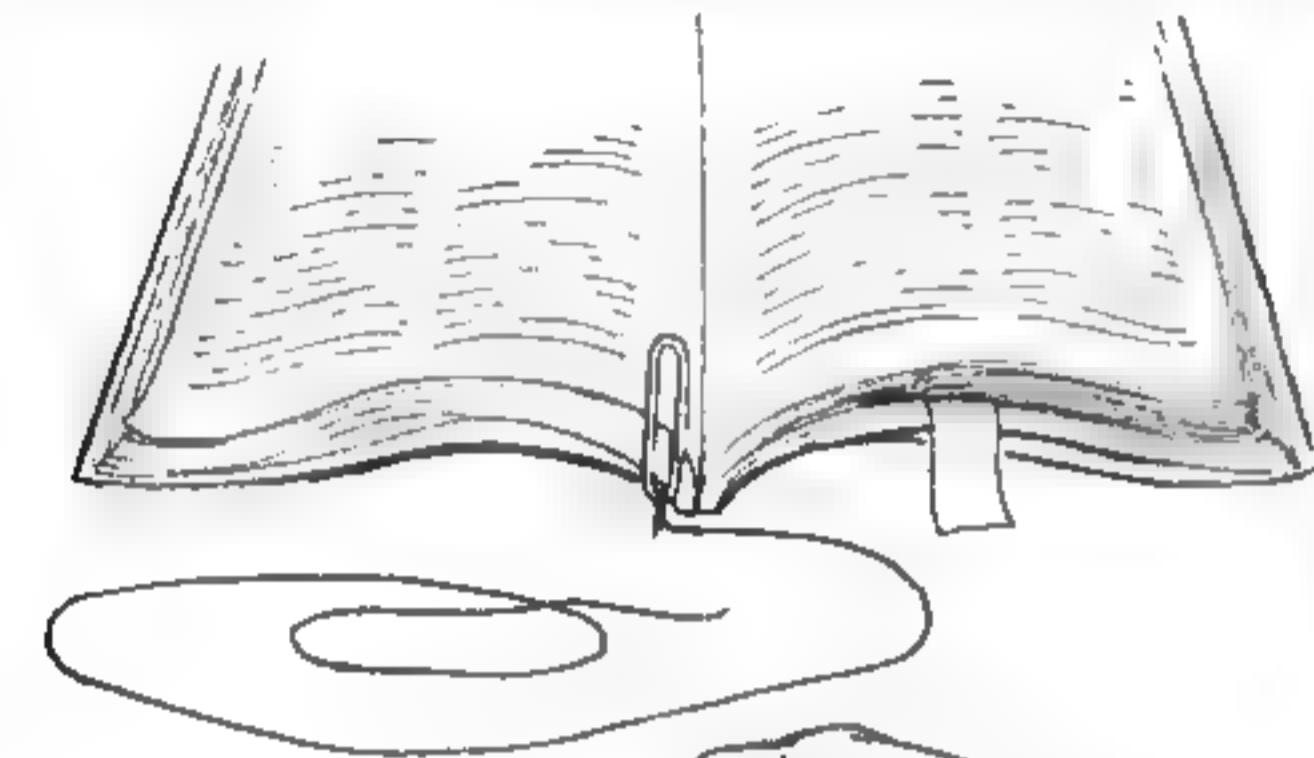
You can get a full range of trim pieces in plastic, too



Tearing Out Pages for the Home Owner's Book

THREAD and a paper clip make an effective tool for removing magazine pages you want to save. The thread cuts

closer to the binding than any scissors. And it won't loosen other pages too, as a razor blade usually does.

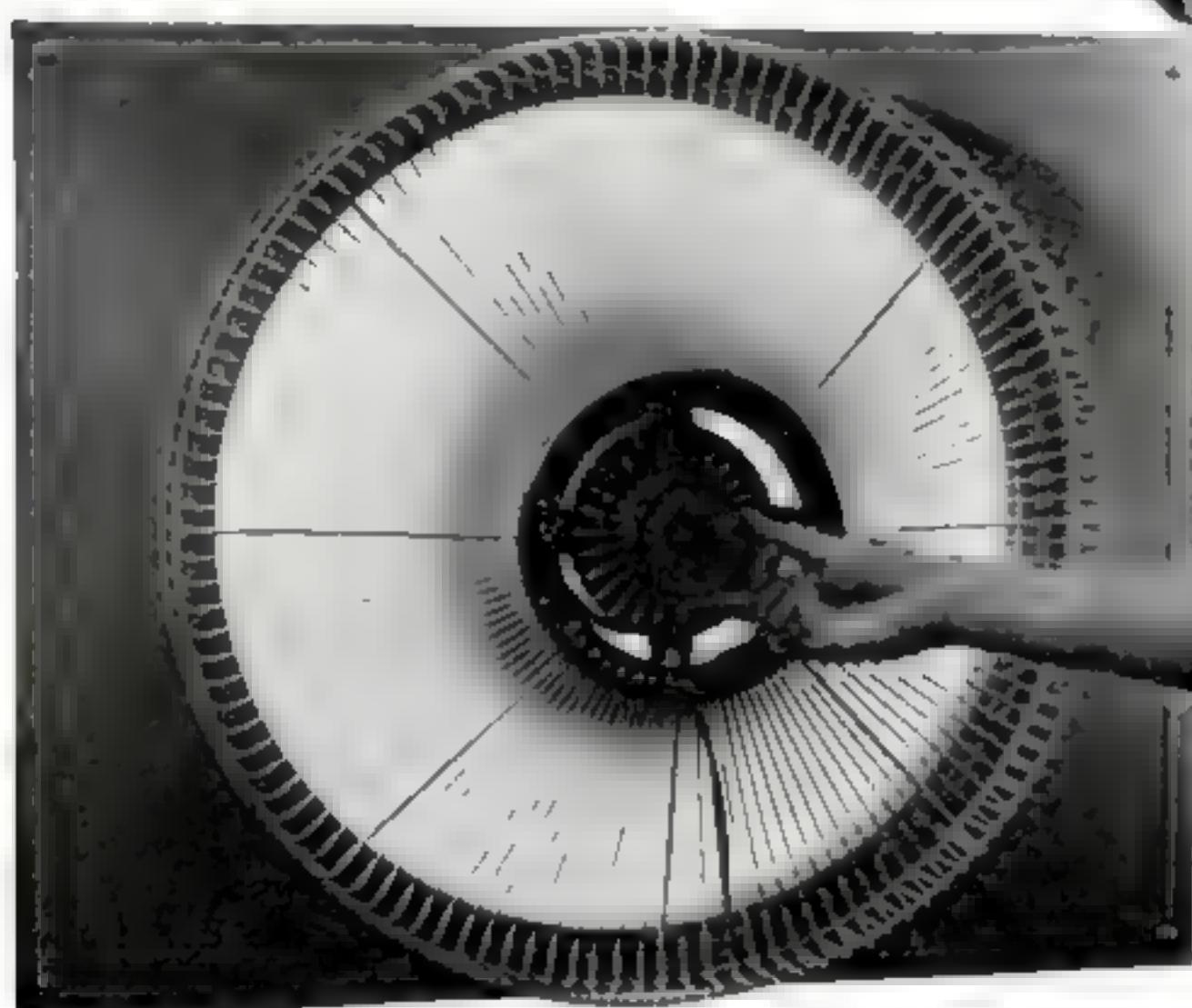


1 ANCHOR PAPER CLIP in the magazine by sliding it over a dozen or so pages, well beyond the page you want to remove. Let the clip stick out a bit while you tie a piece of thread on it that's twice the length of the magazine. Then shove the clip in tightly against the magazine's centerfold.

2 LAY THE THREAD in place along the centerfold, between the page you want to remove and the page following. Stretch the thread taut, pulling it tightly into the crease. Now turn the page that you've selected over onto the thread.

3 CUT THE PAGE FREE by pulling the thread while you hold the magazine open and flat. Pull slowly, keeping the thread roughly at right angles to the crease. It only takes a few practice tries, you'll find, to cut perfectly straight edges.

Buyer's Guide to the '58 Window Fans



Picking the right size and capacity can be tricky. Here are the facts on getting the most cooling for your cash

By Ralph Treves

WINDOW fans have come a long way from the early wheezers. New slim, streamlined models have caused sales to soar from 320,000 in 1950 to more than 2½ million last year. Many of them have speed selectors, reversing switches to blow air either way, and built-in thermostats that turn them on and off while you sleep. All abound with glitter to attract the eye.

But—and here's the big point—a window fan's real job is still to move air. How much it moves will determine how cool you'll be. That's what you pay for—not the fancy trim.

Air-moving capacity is particularly im-

portant today because modern fans are used differently from their earlier predecessors. Instead of just circulating already-hot air *inside* a room, they're designed to fit in a window and exhaust hot, stagnant air *outside* a room.

As the hot air is pulled out, fresh outside air—up to 20 degrees cooler at night—is pulled in through other windows. The trouble here is that it takes a lot more capacity to pull air out a window than just to move it around inside.

That's why it pays to pick a fan carefully. **How big should it be?** Fan capacity is measured by the number of cubic feet of air it will deliver every minute. In mild northern states, a complete change of room air once every three minutes is usual-

Consumer News

The new WINDOW FANS:

MANUFACTURER	MODEL	LIST PRICE	BLADE SIZE (in.)	AIR MOVING CAPACITY (cu ft/min)		MANUFACTURER'S MOTOR RATING	NUMBER OF SPEEDS	BUILT-IN THERMOSTAT	REVERSING SWITCH?
				Cooling	Circulating				
AIR KING	SQ 20-E	\$39.95	20	3,250	4,000	n.a.	2	yes	yes
	RA 20	\$39.95	20	3,250	4,000	n.a.	3	no	no
	20-R	\$49.95	20	3,250	4,000	n.a.	3	yes	yes
	SQ 20 PB	\$49.95	20	3,250	4,000	n.a.	3	yes	yes
	AV 16-E	\$54.95	16	2,000	2,460	n.a.	2	n.a.	yes
	FM 20	\$69.95	20	3,250	4,000	n.a.	3	n.a.	n.a.
	AV 20-PH	\$69.95	20	3,250	4,000	n.a.	3	yes	yes
BAN-BROOK	W 222	n.a.	22	n.a.	2,800	1/12 hp	2	no	no
	RW 222	n.a.	22	n.a.	3,450	1/12 hp	2	no	yes
	W 302	n.a.	30	n.a.	4,800	1/6 hp	2	no	no
	RW 302	n.a.	30	n.a.	4,800	1/6 hp	2	no	yes
CHELSEA	W-5	\$49.95	16	n.a.	2,500	1/11 hp	n.a.	yes	yes
	B-3	\$49.95	20	n.a.	3,800	1/11 hp	4	no	yes
	B-4	\$49.95	20	n.a.	3,800	1/11 hp	n.a.	yes	yes
	W-1	\$49.95	20	n.a.	3,800	1/11 hp	4	no	yes
	W-2	\$59.95	20	n.a.	3,800	1/11 hp	n.a.	yes	yes
COOLAIRE	U-2016	n.a.	20	3,000	n.a.	1/6 hp	2	no	no
DIENHL	Economy	n.a.	20	2,100	n.a.	n.a.	2	no	yes
	Armaster	n.a.	20	2,100	4,000	n.a.	2	no	yes
	Deluxe	n.a.	20	2,100	n.a.	n.a.	2	yes	yes
	Super	n.a.	24	3,600	n.a.	n.a.	2	no	yes
DOMINION	2056	\$29.95	20	n.a.	3,500	170 watts	2	no	no
	2064	\$34.95	20	n.a.	2,500	170 watts	2	no	yes
	2067	\$37.95	20	n.a.	3,500	175 watts	2	no	no
	2054	\$39.95	20	n.a.	3,500	200 watts	2	no	yes
	2053	\$42.95	20	n.a.	3,500	170 watts	2	no	no
	2066	\$43.95	20	n.a.	4,000	200 watts	2	yes	no
	2055	\$44.95	Twin 12	n.a.	2,500	150 watts	2	no	no
	2065	\$49.95	20	n.a.	4,000	200 watts	2	yes	yes
FASCO	2002	n.a.	20	n.a.	2,700	140 watts	2	n.a.	yes
	2005	n.a.	20	n.a.	3,000	150 watts	2	yes	yes
	2075	n.a.	20	n.a.	3,200	150 watts	3	yes	yes
FRESH AIR-AIRE	206 CR	\$49.95	20	n.a.	3,250	n.a.	2	yes	yes
	1128	\$59.95	Twin 12	n.a.	2,500	n.a.	3	yes	n.a.
	ER 208	\$64.95	20	n.a.	3,250	n.a.	3	yes	yes
	FS 208	\$69.95	20	n.a.	3,250	n.a.	3	yes	yes
GENERAL ELECTRIC	W 6	\$29.95	20	2,100	4,000	170 watts	n.a.	no	no
	W 8	\$34.95	20	2,100	n.a.	160 watts	n.a.	no	no
	W 9	\$44.95	20	2,100	n.a.	150 watts	n.a.	no	yes
	W 7	\$44.95	20	2,100	4,000	170 watts	n.a.	no	yes
	T 4	\$59.95	Twin 12	1,500	2,500	140 watts	3	no	yes
	P 3	\$59.95	20	2,100	4,000	170 watts	3	no	no
	W 10	\$69.95	20	2,100	5,000	175 watts	3	yes	yes
HUNTER	J 20	\$29.95	20	2,100	n.a.	170 watts	2	no	no
	D 2058	\$39.95	20	1,900	3,000	150 watts	n.a.	no	yes
	D 202	\$44.95	20	2,100	3,400	130 watts	2	no	yes
	D 201	\$49.95	20	2,100	3,400	130 watts	2	yes	yes
	U 201	\$64.95	20	2,200	4,000	135 watts	2	yes	yes
	W 181	\$64.95	18	2,350	3,600	185 watts	2	yes	yes
	W 12	\$79.95	Twin 12	2,000	2,900	185 watts	2	no	yes
	W 221	\$84.95	22	3,400	4,800	220 watts	2	yes	yes

facts and figures

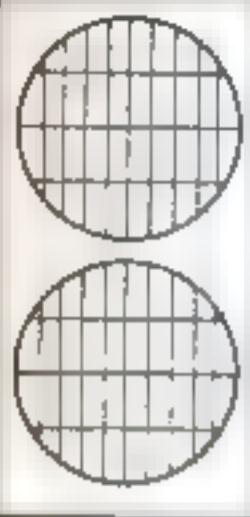
MAKE	MODEL	LIST PRICE	BLADE SIZE [in.]	AIR-MOVING CAPACITY Cu. ft./min. 1		MANUFACTURER'S MOTOR RATING	NUMBER OF SPEEDS	BUILT-IN THERMOSTAT	REVERSING SWITCH?
				Horizontal	Circ. Air				
ILG	204	\$72.95	18	n.a.	3,550	n.a.	n.a.	no	no
KNAPP-MONARCH	7544	n.a.	20	n.a.	3,500	1 1/2 hp	3	no	no
	7548	n.a.	20	n.a.	3,500	1 1/2 hp	3	no	yes
	7554	n.a.	20	n.a.	3,500	1 1/2 hp	n.a.	yes	yes
LAKWOOD	MX 720 3	n.a.	20	2,800	n.a.	1 1/2 hp	3	n.a.	no
	MX 720 2	n.a.	20	2,800	n.a.	1 1/2 hp	2	n.a.	yes
LAU	20RW	\$29.95	20	n.a.	3,950	170 watts	2	n.a.	yes
	20PR	\$39.95	20	n.a.	3,950	170 watts	2	n.a.	yes
	Super 16	\$44.50	16	n.a.	3,000	110 watts	n.a.	n.a.	n.a.
	Super 20	\$49.95	20	n.a.	3,950	162 watts	3	yes	n.a.
	Ultra 20	\$69.95	20	n.a.	3,950	162 watts	3	yes	yes
MANNING-BOWMAN	200M1	\$47.95	20	n.a.	n.a.	2.5 amps	2	yes	no
	1.52MA	\$49.95	Twin 12	n.a.	n.a.	150 watts	1	no	no
	9020	\$49.95	20	n.a.	n.a.	2.2 amps	2	no	no
MONTGOMERY WARD	200M1	\$49.95	20	n.a.	n.a.	2.2 amps	2	no	yes
	B6A246RMJ	\$52.95	20	n.a.	2,600	n.a.	3	no	no
	B6A2451R	\$52.95	20	n.a.	3,100	n.a.	3	no	no
	B6A2466MD	\$54.95	20	n.a.	3,600	n.a.	3	yes	yes
	B6A2461R	\$54.95	20	n.a.	3,900	n.a.	3	yes	yes
	B6A2455MD	\$58.88	20	n.a.	5,160	n.a.	3	yes	yes
	B6A2458R	\$65.50	22	n.a.	4,600	1 1/2 hp	2	no	yes
SEARS, ROEBUCK	4HM1-1	\$9.75	20	1,850	n.a.	1 1/2 hp	2	no	no
	34HM8-10L	\$9.95	20	n.a.	2,400	1 1/2 hp	2	no	no
	4HM1-18L	\$29.50	20	1,850	n.a.	1 1/2 hp	2	yes	no
	34HM8-16-7L	\$9.95	20	n.a.	3,140	1 1/2 hp	1	yes	no
	4HM1-18-14L	\$10.95	20	2,450	n.a.	1 1/2 hp	2	no	yes
	34HM8-18L	\$41.95	20	n.a.	3,310	1 hp	**	yes	yes
	4HM1-140	\$57.50	20	3,850	n.a.	1 hp	2	no	yes
	34HM8-08	\$62.50	20	3,850	n.a.	1 1/2 hp	*	yes	yes
SILEX	42HM9-148	\$67.50	24	4,250	n.a.	1 1/2 hp	2	no*	yes
	1-9	\$44.95	20	1,800	3,000	155 watts	2	no	yes
	1-72	\$46.95	Twin 12	1,400	2,225	140 watts	n.a.	yes	n.a.
VIKING	720	n.a.	20	2,400	1,200	1 1/2 hp	2	no	no
	1120	n.a.	20	2,500	3,600	1 1/2 hp	2	yes	yes
VORTEX	955	n.a.	22	3,500	n.a.	1 1/2 hp	2	no*	yes
	16A	\$44.95	16	n.a.	3,325	128 watts	2	no	no
	2-A	\$49.95	20	n.a.	4,865	162 watts	2	no	no
	16AT	\$54.95	16	n.a.	3,325	128 watts	2	yes	no
	20AT	\$59.95	20	n.a.	4,865	162 watts	2	yes	no
	16AR	\$64.95	16	n.a.	40.5	63 watts	2	yes	yes
	20AR	\$69.95	20	n.a.	5,111	101 watts	2	yes	yes
	20AS	\$79.95	20	n.a.	5,111	101 watts	2	yes	yes
	R 2024	\$44.95	Twin 10	800	2,000	125 watts	2	no	no
	CS 3512	\$46.90	20	2,100	3,500	230 watts	2	no	no
WESTINGHOUSE	CD 3522	\$56.90	20	2,100	3,500	200 watts	2	no	yes
	R 4521	\$64.95	17	3,400	4,500	250 watts	2	no	no
	AC 4021	\$69.95	20	2,900	4,000	170 watts	2	yes	yes
	AC 4022	\$69.95	20	2,600	4,000	170 watts	2	yes	yes

NOTE: n.a. This information not available

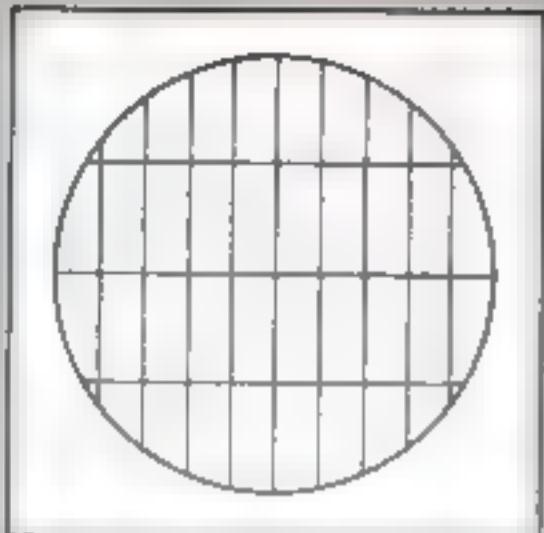
*Has timer

**Continuously variable

Which Fan Would You Buy?



TWIN 10" FANS



SINGLE 20" FAN

Why they aren't the same:

$$\text{AREA OF CIRCLE} = \pi R^2$$

AREA OF 2 10" FANS

$$= 3.1416 \times 5^2 \times 2$$

$$= 3.1416 \times 25 \times 2$$

$$= 3.1416 \times 50$$

$$= 157.08 \text{ SQ. IN.}$$

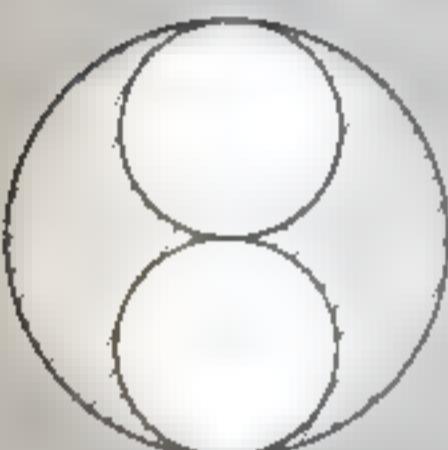
AREA OF 1 20" FAN

$$= 3.1416 \times 10^2$$

$$= 3.1416 \times 100$$

$$= 314.16 \text{ SQ. IN.}$$

(TWICE THE AREA OF TWO 10" FANS)



TWO 10" CIRCLES
FIT INSIDE ONE
20" CIRCLE WITH
ROOM TO SPARE

WHY TWO SMALL FANS DON'T EQUAL ONE BIG ONE is shown above. Total area of twin 10" fans is only half that of one 20" fan. Actual air-moving capacity is cut one-third to a half. Twins are good for narrow windows, but you should use single large fan wherever possible.

ly sufficient. In warmer southern areas, an air change every one or two minutes is required. A fan with a capacity of 2,000 cubic feet per minute (c.f.m.) will thus change the air once every minute in a 2,000-cubic-foot room or once every three minutes in a 6,000-cubic-foot room (or the equivalent in several small rooms put together).

If you figure the cubic feet in your own rooms (length times width times height), you can tell how much capacity you need. But now here's the joker. The published capacity of a fan may apply only to its

"circulating" rating—the amount of air it can move in the open. What you really want to know is the "exhaust" rating—the amount of air it can pull out the window. When matching a fan to a room, always use this exhaust rating (sometimes called "ventilating" rating).

A fan with a circulating rating of 4,000 c.f.m. may have an actual exhaust rating of only 2,500 c.f.m. Where you can get only the circulating rating, you can figure that the exhaust capacity will be only two-thirds to half as high.

To protect the consumer against misleading specifications, several trade associations have established standards for measuring fan performance. Most fans have the approval of such recognized associations as NEMA (National Electrical Manufacturers Assn.), AMCA (Air Moving and Conditioning Assn.), NAFM (National Assn. of Fan Manufacturers), PFMA (Propellor Fan Manufacturers Assn.), and ASHAE (American Society of Heating and Air-Conditioning Engineers).

What does blade size mean? Most manufacturers have settled this year on the 20" size, which is the diameter of the blades. A few makers still offer a 16" or 17" size for use in windows too small to take the 20" size.

Blade size alone, however, does not determine capacity. Two identical-looking 20" fans may differ as much as 1,000 c.f.m. in air delivery—enough to handle a fair-sized room. No matter what size you pick, the best buying yardstick is still: rated capacity in c.f.m. Do not, however, ever buy a larger blade size than the window opening, even if you can fit the fan in front of the window. A partially blocked fan will set up back pressure against the blades and put a strain on the motor.

How about twins? Double fans—usually two 10" or 12" units mounted in a single frame—are fine for very narrow windows, such as casements, where larger fans won't fit. Their combined capacity, however, is much less than that of one 20" fan. (If you compare the area of two 10" circles with one 20" circle, you can quickly see why this is so.)

[Continued on page 204]

NEXT MONTH

• What wrenches do you need in your house? What size? How should you use them? August PS features a tear-out booklet on these valuable tools: "Choosing the Right Wrenches."

what's new

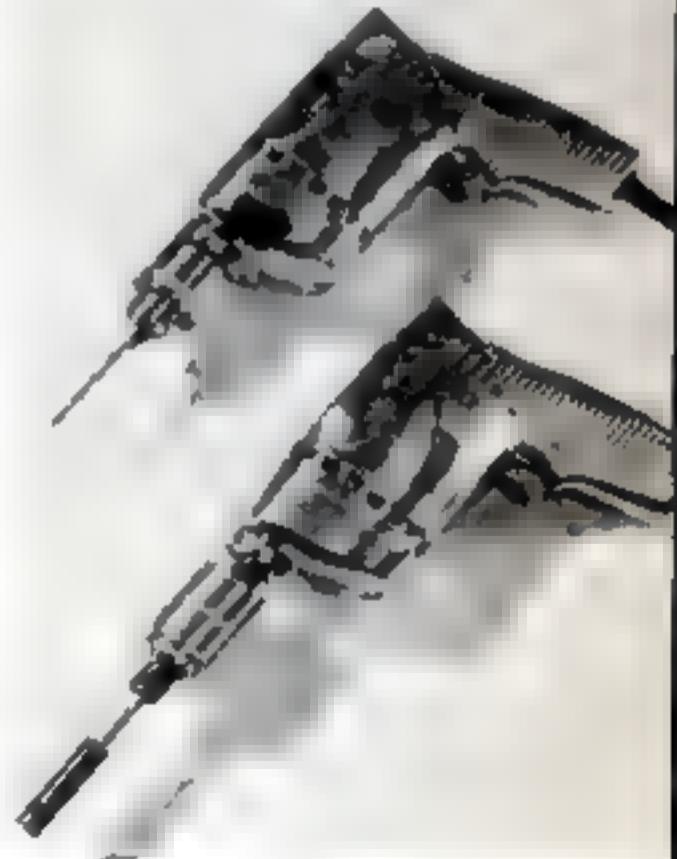
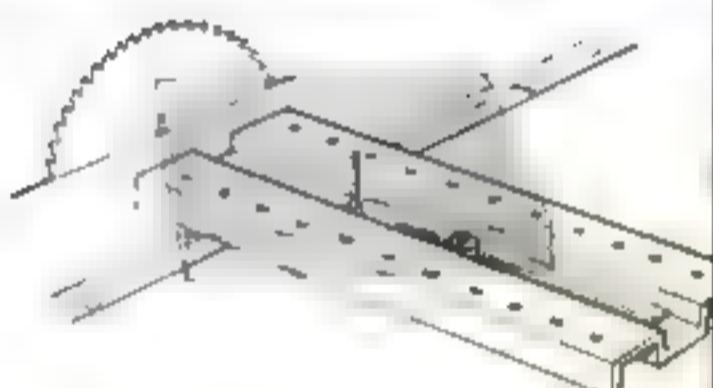


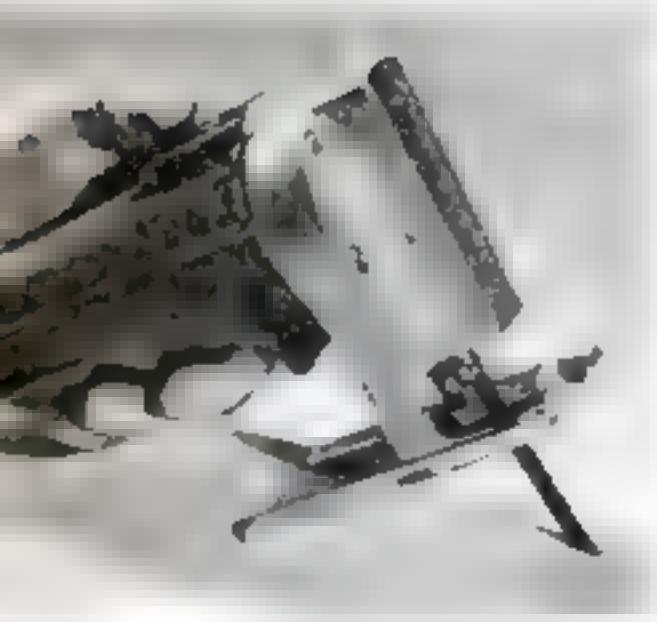
the latest in tools

New circle-cutting jig above is an adjustable version of the old pivot-sawing trick. You set a pin to any desired radius, as at right, make a series of straight cuts, then rotate the wood against the saw. American Home Tool Corp. sells the jig for \$4.95.

Interchangeable chucks on a new line of Stanley tools let you have either a $\frac{3}{8}$ " electric drill (upper right) or a power driver (lower right) for running in screws or nuts. The power-driver chuck has an impact-type friction clutch that automatically lets go under a sudden overload. It takes a full line of slotted and Phillips screwdrivers, socket wrench heads and shaft extensions. The tools will be sold separately as two drill models (\$39.95 and \$44.95) and as two power-driver models (\$42.95 and \$48). Additional chucks will then be made available for conversion of either type to the other. All models are rated at 2.5 amps, 800 r.p.m.

Soft-faced hammers with replaceable heads can get banged up without becoming ruined. The heads are made of Tenite plastic, and when one set wears out you simply screw on another set. Made by Cusantite Corp., the mallets come in two-, $2\frac{1}{4}$ - and three-pound sizes, and are said to reduce shock and bounce in use.





Latest electric handsaw to join this fast-growing field is the new-model Wen at left, now available as a kit that includes carrying case, five blades and a rip and circle-cutting attachment for \$32.95. The saw has a built-in chip blower, is said to cut $\frac{1}{2}$ " steel, 2" wood.

A sliding-jaw C clamp can be quickly set to fit the work, saving clamping time. Made by Research Engineering, it has a flat, sturdy base so it can also be used as a stand-up jig . . . For those who don't like the fine print on micrometers, Brown & Sharpe has a **direct-reading micrometer** that pops up big-size numbers behind a plastic window—like your car's mileage counter.

what's new for the family car



An extra "trunk" on top of the trunk (at left) makes it easy to add luggage space to convertibles and other cars that can't take a roof rack. The detachable rack is hinged at the front just above the rear deck and can be quickly raised on two telescoping poles at the rear when you want to open the trunk lid. The Benmatt Organization sells the 36"-by-62" chrome-and-hardwood deck for \$79.50.

Your car can't slip off the jack, with a pair of adjustable chocks sold by Burbank's. Two wedge-shaped blocks are fitted around a wheel and tightened together so the car can't roll forward or backward. Price is about \$7.

Dash-mounted coin dispenser keeps four nickels and six dimes or pennies within easy reach for tolls, parking meters or telephone calls. Car-Coin Co. sells the plastic holder for \$1.

Convertible camping trailer, at left, when unfolded turns into a 13' plastic boat or—guess what—a 16"-deep wading pool for the kids. On the road, the Aqua Trailer will haul up to 700 pounds. Price is \$795 . . . **An electric-powered backrest** gives you a motorized back rub as you drive, said to reduce fatigue and relax stiff muscles. Made by Niagara, the massaging pad just plugs into the cigarette-lighter socket . . . **Less static interference in car radios** is the claim of a new antistatic powder that can be blown into your tires. A kit, including valve injector, is sold by Speedex for \$2.75 . . . **A remote-controlled side mirror** can be tilted up or down or rotated by turning a knob on the dash. Alted Corp. sells it for about \$11.



for more information:

Here's where to write if you can't get any item listed above:
Alted Corp., P.O. Box 118, Bangor, Mich.; American Home Tool Corp., 350 Broadway, NYC; A.M.I. Inc., Grand Rapids,

Mich.; Aqua Trailers, Inc., North 1039 Division, Spokane, Wash.; Benmatt Organization, 962 Milwaukee Ave., Chicago 22; Brown & Sharpe Mfg. Co., Providence, R.I.; Bright-Maker, 516 University Bldg., Denver 2, Col.; Burbank's, 10 Burbank St., Oxford, Mass.; Car-Coin Co., P.O. Box 6838,

for the home handyman

New heat-reflecting roof panels, at right, have a thin sheet of perforated aluminum foil sandwiched between layers of corrugated plastic. The aluminum lets in light through the holes, but is said to block 80 percent of the sun's heat, keeping a porch or patio cool underneath. The Resolite panels come in four colors, 26" or 40" wide and 8', 10' or 12' long. You can drill, saw and nail them in the same way as conventional plastic panels. Price is \$1.25 a square foot.

Three lawn-watering aids: *A combination sprinkler-soaker hose* can be adjusted to give anything from a full spray to a fine trickle—by sliding sleeve valves over slits in the side of the hose. It's sold by Grotel in 30' lengths for \$5.95 . . . *A slide-type valve*, made by Melnor, quickly turns water on or off at any point along a hose line without your running back to the faucet . . . *A spring-clip hose holder* clamps to a stake, fence, pail or other support to free your hands. Rite-Flo sells it for 80 cents.

New awnings roll up and down like a window shade to give you any amount of sun or shade you want. The awning material winds itself up on a hinged aluminum frame that can be set at any angle outside the window. Five widths are available from 36" to 60" for about \$20 to \$30 apiece. Pyramid, the maker, says the awnings can't leak, rot or mildew and need never be taken down.

For the handywoman: *A portable tubless clothes agitator* that converts any tub or large pail into a washing machine. The electrically powered unit is 6 $\frac{3}{4}$ " in diameter, weighs only about 9 $\frac{3}{4}$ pounds, and will handle up to four pounds of wash at a time. Made by A M I, it will sell for \$59.95.

Universal curtain-rod brackets are put up once and left in place no matter how many times you change rods. Clamps on the brackets let you attach all styles of curtain hardware without drilling fresh holes every time a new type is put up. The brackets are sold by Brunt-Maker for \$1.65 a pair.

Sheldon Galloper

Kansas City, Mo., Captainite Corp., 1228 Utica Ave., Brooklyn, N.Y.; Gentel, P.O. Box 611 La Habra, Calif.; Melnor Industries, 300 Dellitt Ave., Brooklyn, N.Y.; Niagara Cycle-Massage Co., 114 E. 60th St., N.Y.C.; Pyramid Co., 1384 Broadway, N.Y.C.; Research Engineering and Sales Co.,

1014 Longfellow, Royal Oak, Mich.; Resolite Corp., Zeleznopole, Pa.; Rite-Flo Mfg. Co., 1922 S.W. 1st St., Des Moines, Iowa; Speedex Mfg. Co., 400 S. Franklin St., Rockford, Ill.; Stanley Tools, 111 Elm St., New Britain, Conn.; Wem Products, 5810 Northwest Highway, Chicago 31.



New Carry-Along Spray Compressor

builds up air pressure like a supercharger

A ROTOR compressor no larger than a quart can of paint now puts the air supply for big spraying jobs in the palm of your hand. You can hold it easily while you climb a ladder, or work from one end of a long fence to the other. It weighs a mere 4½ pounds.

The tiny compressor is the heart of a new paint-spraying rig called the "Sprayit 400." It works on the principle of a miniature supercharger. Under its cast-aluminum housing a quarter-horse motor revs a small rotor up to 8,000 r.p.m. The result is an output of about 1½ cubic feet of air per minute, delivered at a constant working pressure of about 18 pounds to the square inch.

While this pressure is lower than that delivered by some other compressors, the Sprayit 400's pressure-feed-type gun has the effect of upping the 18 pounds. "Pressure feed" means that air is driven into the canister to lift paint to the nozzle, rather than drawing it up, siphon-fashion, by an overblast. This offers much greater lifting power in relation to air pressure—important when you're handling heavy-bodied materials.

An internal-spray nozzle—one in which air and paint come together within the cap—again makes the most efficient use of compressor output. Once you plug in the motor, air bleeds through this nozzle constantly, preventing back pressure. Triggering the gun starts and controls the flow of paint.

Two adjustments give you just about any size and shape of spray pattern you want. You can produce a vertical or horizontal oval depending on which way you turn the slotted nozzle tip. For fine pinpointing, the pattern can be narrowed down to the size of a dime. For large coverage, it can be blown up to about a foot in diameter.

Under tests, the gun has successfully sprayed all sorts of materials from thin insecticides to thick house- and floor-paints. Even quick-drying lacquers have not clogged the nozzle during shut-off periods of up to 10 minutes between spray coats. Best bonus of the low-pressure air delivery is said to be the very small amount of overspray—the slop-over of spray where you don't want it. This is as little as an inch with the gun held about a foot away.

Made of high-impact-resisting plastic, the gun is light and has a comfortable two-finger trigger grip. A small stand on the bottom of the compressor doubles as a good hand grip, and a thermal cut-out on the motor guards against excessive heat.

The compressor runs at a high-pitched whine—louder than the noise of a vacuum cleaner. The Sprayit 400 sells for \$39.95, and is a product of Thomas Industries, Inc., 410 South Third Street, Louisville 2, Ky.—*Henry B. Comstock*.





The Big Bargains in Two-Eyed Cameras

By Maryann Smith

SO YOU want to buy a camera that will take snapshots—that's all. But the store clerk drags out an expensive-looking, knob-littered box that has not one but two lenses—one to take the picture and one to let you see what the camera is taking.

This, he starts to explain, is a twin-lens reflex. It has all the pro features...

You're not a pro, don't want to be a pro and certainly don't want to pay pro prices. You explain that what you really want is a simple camera—one that will give you good enough drugstore prints to please the wife and kids without costing an arm and a leg or requiring a graduate degree in physics to operate it.

The clerk brings out another camera. It has two eyes, just like the first one. He's not fooling you—this is a reflex, too. Probably expensive.

\$17.95, he tells you. On the shelves, you begin to notice row upon row of the same two-eyed, boxy-looking cameras. The price tags run \$23.46, \$29.50, \$37.75, \$46.95, \$58.50—all the way up to \$200 and \$300 models. You're bewildered. Who buys these things? Why the big differences in price?

Big boom in reflexes. The fact is, more than half a hundred different makes of twin-lens cameras have crowded onto dealers' shelves, most of them within the last two or three years. More than half of all models on the market sell for less than \$60—and half of these sell for even less than \$30.

Obviously, the lowest-priced models aren't bought by professionals. They are bought, say dealers, by everyone from experienced amateurs to casual vacationing snapshooters. The twin-lens design has become so popular, in fact, that it is already setting something of a pattern for many simpler cameras.

The one the clerk showed you for

\$17.95, for instance, is Kodak's Duoflex. While essentially a fixed-focus box camera, it has many advantages of higher-priced models. You look down through a large viewfinder in the top, as with any reflex, and see the scene you want to shoot exactly as it will appear on the film.

Both Ansco and Argus also make similar box cameras using the two-lens principle. All have self-cocking shutters, built-in double-exposure prevention, and can be equipped with flash. There's even a twin-lens Brownie, at \$10.75, which has been one of Kodak's biggest sellers.

Why a reflex? Its ability to take a picture through one lens and let you see what you're taking through another lens is the chief charm of the twin-lens—and the chief reason for its popularity. If you recall the many home snapshots with lopped-off heads and tilted horizons, you can see why. The twin-lens reflex takes the guesswork out of planning and posing a picture.

In cameras with adjustable focus, this is an even greater advantage. The lower, picture-taking, lens is arranged to work together with the upper viewing lens. As the scene becomes crisp and clear in the viewfinder, you know that the taking lens is also in focus.

The twin-lens reflex is a happy compromise: It provides for those who want to shoot for black-and-white prints and those who want color slides. Most models use either 120 or 620 film, which both provide a $2\frac{1}{4}$ "-square picture. This is small enough for projection of color, yet large enough to give you direct prints without requiring enlargements.

Just in the last year, two smaller versions using 127 film have been brought out: at \$133 by the German firm that makes the classic Rollei, and at \$59.95 by the Japanese makers of the fast-selling Yashica. The two provide a $1\frac{5}{8}$ "-square picture that cuts considerably the cost of color film. Kodak's little Brownie



UNDER \$15

Penta Reflex



UNDER \$20

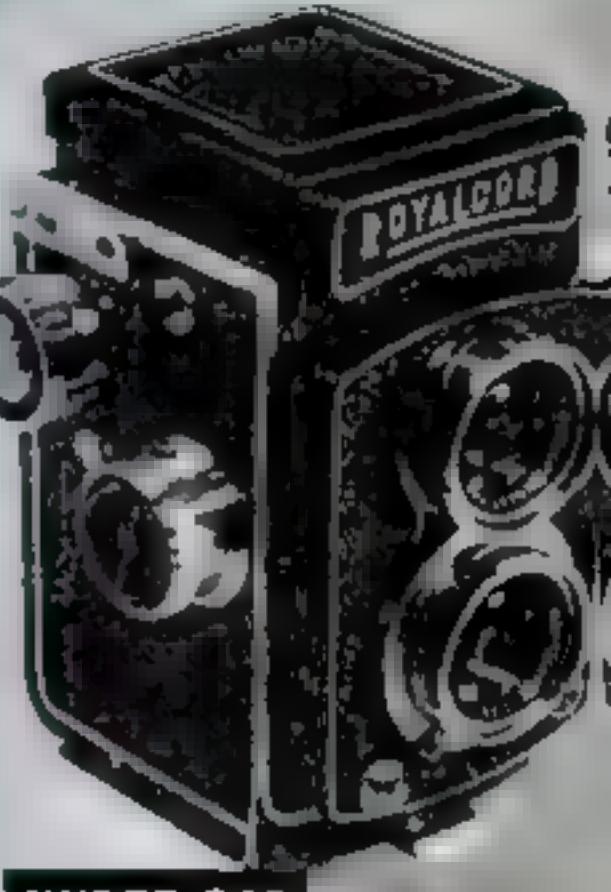
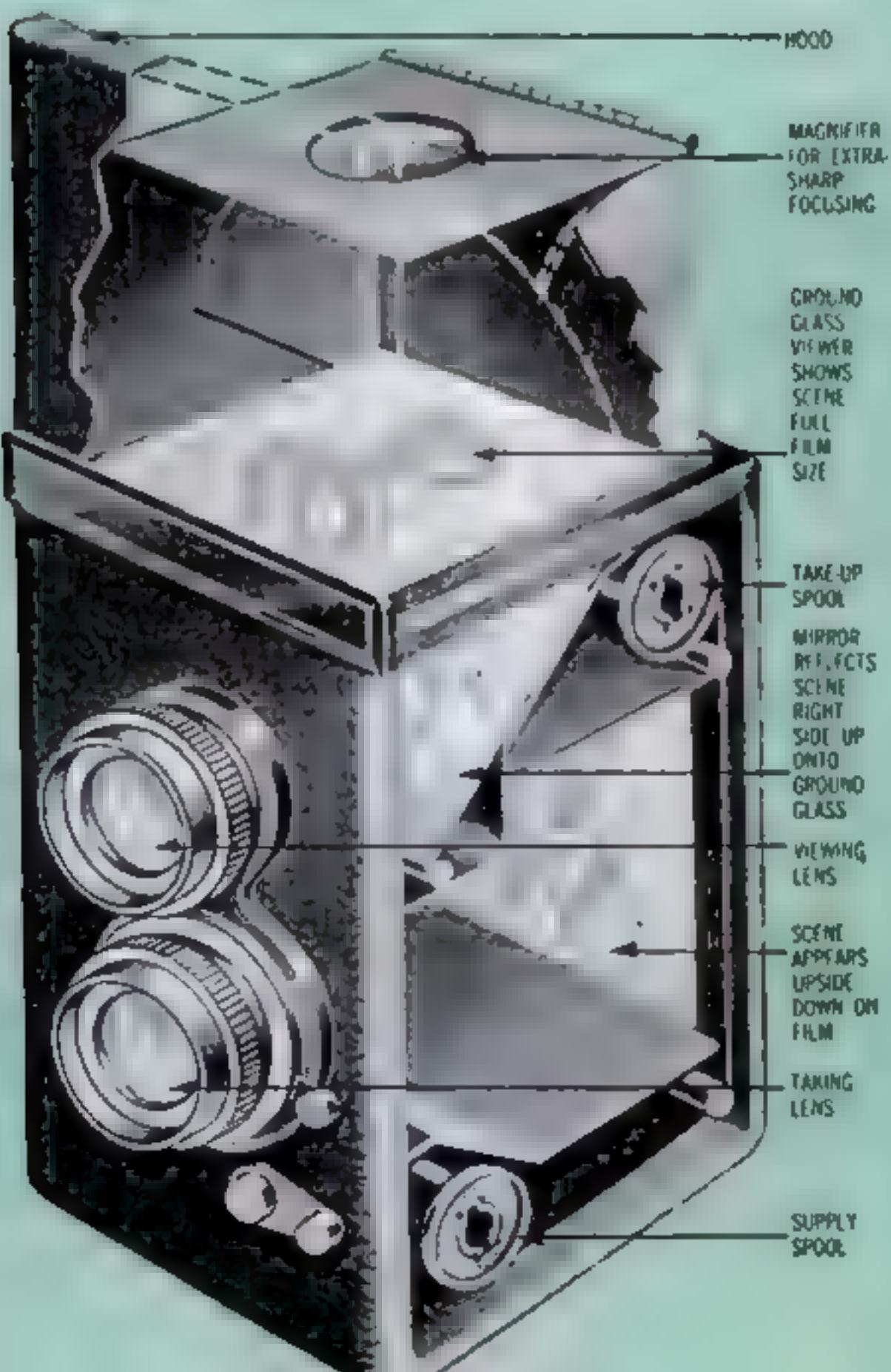
Kodak Duaflex



UNDER \$30

Tower (Sears, Roebuck)

The classic reflexes still come high—but many low-cost makes use the same design



UNDER \$40

Royalord

Yashica "44"

UNDER \$60



also uses 127 film, and other models are likely to appear soon. Several models (including Rollei, Ricohflex and Yashica) also let you use the still-cheaper 35-mm. color film in the same $2\frac{1}{4}$ " cameras by means of adapters. These are important if you plan to go in for 35-mm. color slides.

What do you really get? Perhaps you wonder if bargain prices aren't just for the very cheapest cameras. The store clerk lines up five or six more cameras on the counter. \$29.95, he tells you—all of them. What's more, he points out, you get an f/3.5 lens. Only a few of the most expensive models have faster f/2.8 lenses. You



CRANK-TYPE REFLEX moves film and cocks shutter automatically. Kalloflex above (sold by Grafex) combines crank and focusing knob in novel one-hand arrangement, sells for \$119.50.

also get shutter speeds up to 1/300 of a second—fast enough to shoot pretty nearly anything you'll want to point a camera at. Sears, Roebuck (Tower) and Montgomery Ward (Wardflex) sell similar cameras, both also priced at \$29.95.

How good are they? At these prices, you naturally don't get all that a \$300-plus model will give you. But you do get a whale of a lot. Mass production and the rising popularity of twin-lens cameras have brought the price down. And today's films make it possible for inexpensive cameras to take much better pictures than they used to.

Extra features. What else you get beyond a basic camera depends on how much you spend for added convenience.

The Penta Reflex, at \$14.95, is currently the lowest-priced true twin-lens reflex with

an f/3.5 lens and speeds up to 1/100 of a second. The Super Ricohflex, at \$19.95, is the lowest-priced model with interchangeable backs to permit the use of both 120 and 35-mm. film. Up to about \$46, you'll get shutter speeds up to 1/300 of a second; beyond this, you can expect speeds of 1,400 and 1/500.

Most inexpensive models, up to about \$40, use a lever on the front to focus the lens. On higher-priced cameras, look for a focusing knob on the side, which you may find easier to handle than reaching around in front of the camera. In the \$40-and-up bracket, you'll also find an automatic film stop. You just start the film at the first frame and from then on it automatically stops at each frame as you wind the advance knob. The Royalcord, at \$39.95, is the lowest-priced camera to have this feature.

One point to check carefully is the overall brightness of the ground-glass viewfinder. The brighter it is, the easier it is to see and focus. You may find that some of the less expensive cameras rate as well or better on this than the top models.

Built-in light meters begin coming into the picture at \$59.95. And once you hit the \$75-and-up bracket, you're in the film-crank class. (The 127-film Yashica "44," at \$59.95, is the one lower-priced exception.) One turn of the crank advances the film and also sets the shutter. At \$119.50, the Kalloflex (sold by Grafex) has a combination film crank and focusing knob so you can work both controls with the same hand.

As you keep going over the \$100 mark, more of the aperture and shutter-speed mechanisms are coupled. You make the initial setting, and thereafter if you want to change either the f-stop or speed, the two move with one motion.

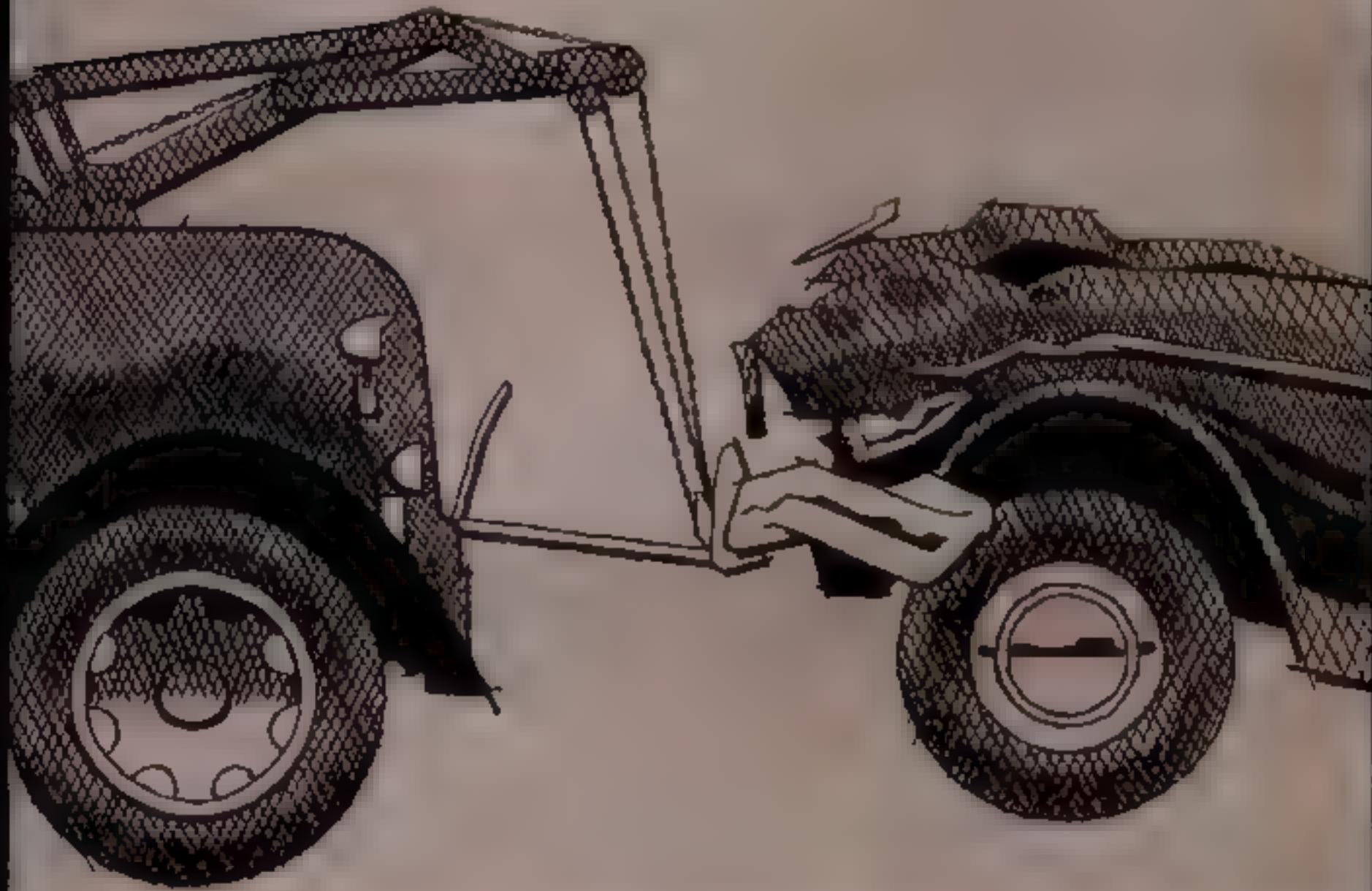
In many instances this coupled system, referred to as Exposure Value System (EVS) or Light Value Scale (LVS), works in conjunction with a built-in light meter.

Interchangeable lenses are the newest development offered by two twin-lens cameras in the top-price field. The Mamiya comes with a standard 8-mm., f/2.8 lens for \$159 and offers (at extra cost) four additional wide-angle and telephoto lenses. The Koniflex comes with both standard and telephoto lenses included for \$300.

END

POPULAR SCIENCE REFERENCE LIBRARY No. 10

What to Do If You Have
an Auto Accident



Where to find the facts

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Foreword

ACCORDING to the grim averages of the road, you stand a one-in-three chance of meeting with an auto accident some time this year. Fortunately the same statistics say it's likely to be a minor scrape, but the smallest injury you can figure to get away with is a case of writer's cramp.

Filling in forms and asking and answering questions is a serious business.

Though you may think you're fully insured, damage claims—including unjustified ones—could strip you of everything you own or tie up your income for life. And even if you're an innocent victim you can put yourself in the wrong by what you do or fail to do.

So it makes sense to learn the ropes before you find yourself dangling from them. Then, if the need ever arises, you'll be able to practice the basic rules of post-accident protection: Keep cool, and know what you're doing.

First things first

Regardless of who's at fault—and there are good reasons for not trying to parcel out blame on the spot—these are the first important steps:

- Turn off your ignition switch.
- Take care of any injured.
- Make sure your accident won't cause another. If the cars are in the way of oncoming traffic, move them or do what you can to warn off other drivers.
- Call the police (unless it's just a trivial scrape). Note the badge numbers and precinct or barracks locations of the officers who respond. You may later need their testimony or want to refer to their official reports. Answer police questions honestly, but don't elaborate.
- Exchange name, address, phone number and license information with the other driver. Do not lose your temper or get into arguments. And above all, do not admit responsibility even if you think you goofed. You aren't required to, and a generous admission may harm everyone concerned (see page 5).
- Collect other names and facts. Use

the checklist on page 10 to record data about the other car's driver, owner and occupants, as well as about injured persons and witnesses. (Witnesses often won't want to get involved and you can't force them to give their names. But if you can identify them by license number, house address, police report, or other means, you may later be able to subpoena their testimony.) Make a note of road and weather conditions and the time and location of the accident. Examine the damage suffered by the other car and look for previously acquired nicks and dents; if you should have to foot repair bills, there's no reason to take on any unrelated extras. If you have a camera along, take pictures of accident scene and damage.

You need a complete record of the events and people involved, because even when the facts of an accident seem crystal-clear, you can easily get bogged down in tricky repair procedures, claims, counterclaims and legal runarounds. And the exact sequence of your next moves may depend on who's insured for what.

If anyone's hurt

CALL a doctor or ambulance immediately if anyone is obviously hurt. Unconscious persons, or those who may have suffered fractures or head or spine injuries, should be kept warm until medical help arrives; do not attempt to move them unless it is urgently necessary to stop profuse bleeding or to protect them from fire or other harm.

In any severe shake-up it is a good idea to insist on medical attention for everyone; shock some-

times makes people unaware of physical injury. Offer to pay for examinations, if necessary, and if anyone still declines, ask the doctor or a policeman to take note of his refusal. This could help to prevent or reduce exaggerated claims of injury.

When a doctor is called, get his name and address and that of any hospital to which the injured are taken. Medical expenses may be recoverable, so get receipts for all bills you may be required to pay. If more than one patient is involved, keep the records separate.

Types of insurance:

Liability: Whether or not you are to blame, you can be sued for deaths, personal injury, or property damage inflicted by your automobile. Liability insurance will protect you against the costs of legal defense and—up to the limits of a policy—pay claims for which you are held legally liable.

Two types of liability insurance—one covering bodily injury, the other property damage—are available though they are usually packaged in one contract. If you're not sure your policy covers both, you'd better check it now.

Liability insurance pays for claims made against you, but not for any part of your own loss. The insurance usually covers your wife and other people who are authorized to drive your car.

Medical Payments: Medical and hospital bills for your own injuries—and

those suffered by your passengers—are probably not covered by your liability insurance. You may have to pay, unless you can sue the other party or you carry separate insurance for such payments. Medical-payments policies cover some shadowy areas in the law; for example, they'll pay medical costs for your passengers, who might be unwilling to sue you or might not be covered by your liability insurance.

Collision: If you have this kind of insurance, you can recover all or part of the cost of repairing your own car regardless of who caused the accident and—usually—without waiting through a long-drawn legal hassle. Nearly all collision policies have "deductible" clauses: You pay the first \$25, \$50 or \$100 and the company makes up the balance of what it re-

Reporting the accident

YOU must file an official report—and usually two or more. All states as well as some counties and municipalities require detailed information about accidents that cause injury or damage exceeding some fixed amount. You must submit the data on special forms, but regulations—governing the minimum damage that must be reported, the agency that handles the forms, and the amount of time you're allowed for filing—vary from state to state. Find out now what the law is in your locality and either obtain the blanks or make a note on the

checklist on page 10. Should an accident occur while you're away from home, ask the police how and where to file. Do it promptly. All states impose penalties for not reporting. In some they begin after 24 hours.

If you carry insurance, you must also notify the company in writing in order to keep your protection in force. Best procedure is to get in touch with your insurance agent or representative as soon as you can get to a phone. Ask him for help in filling out official reports. He probably can advise you about what you must—or need not—disclose.

what they cover

gards as a reasonable cost of repair or replacement. The policy doesn't allow for extras. You're not supposed to have old dents straightened out on the house. Damaged luggage, clothing and other contents are not covered. If the car is a total loss or repair costs would run too high, you can collect only the current value of the car. Towing costs may be included in the bill, but usually you cannot charge your collision company for substitute transportation (such as taxis or car rentals).

Having an insurance policy doesn't necessarily mean you're properly insured. If you made significant misstatements on your application, if you let the payments lapse, or if you failed to notify the company about changed conditions (such as new teen-age drivers in your family) you may discover that the pretty piece of paper doesn't mean the pretty things you think it says.

On the other hand a policy may have values that do not appear in the printed form. If you have an accident,

you will probably have to prove your "financial responsibility." Failure to do so may cost you your license, car registration, or the car itself until all claims are satisfied. You could establish your "responsibility" by posting a bond or putting up cash, but if you carry liability insurance your company representative will usually supply the needed proof.

Incidentally, don't confuse financial-responsibility with compulsory-insurance laws. New York and Massachusetts now require all car owners to carry liability insurance*; under the financial-responsibility laws in force in other states you don't have to insure but are subject to penalties after an accident if you can't pay damages.

*Massachusetts car owners must insure against death or bodily-injury claims but not property damage. A compulsory-insurance law will take effect in North Carolina July 1, 1959. In Connecticut, Maryland and Rhode Island, teen-age drivers must carry insurance.

Who's at fault?

Responsibility for an accident, as it is finally parceled out, will have a lot to do with payments and losses. Keep in mind, however, that you—the car owner—are on the hook. Your insurance company stands behind you only if you have the right kind of coverage and don't fall through any legal loopholes.

Good sportsmanship could trip you up here because there's just no place for it in court. But the law does make

a distinction between *voluntary* and *legal* liability. Many insurance policies cover only the second kind—that is, the companies undertake to defend you as long as you cooperate and leave them a legal defense. If you erase this by voluntarily assuming blame for an accident (or by failing to notify the company), you may find that you have washed out your insurance protection.

So even if the accident occurred be-

cause you happened to be woolgathering and went steaming through a traffic light, your interests—and your victim's—will be best served if you keep your lip buttoned. This doesn't mean you should deny the facts or lie about them, but rather that you need not and should not talk about them except with a police officer who is legally authorized to question you. Do not sign any statements before you have discussed the case with a representative of your insurance company or your own attorney.

At least one reason insurance companies put such restraints on policy holders is that legal definitions of guilt are usually more complicated than may appear on the surface. In the most common type of accident—a collision at an intersection—both drivers share the blame more often than not, although not necessarily in the same degree. One insurance executive who has handled many thousands of cases says he's never heard of an intersection collision that could not have been avoided

by the exercise of reasonable care by either driver. You may feel completely sure of yourself because you know you had the right of way. But a jury could still find you guilty of contributory negligence. The test question is not whether you were in the right, but whether you had a chance to avoid the accident.

It's therefore unwise, as well as unnecessary, to try to establish blame at the time of the accident. This cuts both ways. If the other driver assumes responsibility, his insurance company may back out on him. You may then find it easier to get a judgment against him—but much tougher to collect damages after you get it. Then, too, you may fail to follow through on the procedures that would give you better protection if he should later change his mind and counter your charges with a set of his own. On the other hand, the most innocent acknowledgment you might make at the time could bounce back after you've forgotten it to confuse or discredit your later claim.

If Insurance claims bog down

HARRIED by countless exaggerated claims and an almost universal belief that it's good form to stick them for all you can get, insurance companies have become suspicious of the public. The feeling is mutual.

If you plan to ask for car-repair costs under your own collision or the other fellow's liability policy, it's a good idea to notify the company involved and submit an estimate before you proceed with the work. Policies usually allow the

company a "reasonable" time to inspect the damage and the estimate before approving payment. A week is generally regarded as fair.

Most companies act promptly and in good faith, often getting a representative to the scene in a matter of hours. Some, however, have a reputation for dragging out settlements, especially of liability-damage claims.

Insurance men deny that any deliberate stalling goes on; impartial experts think there is less than is generally believed. But keep in

Getting repairs

Even if you were responsible, or think you were, for the accident, it can't hurt to keep the possibility of insurance recovery in mind when arranging for repairs. Blame needn't enter the picture if you carry collision insurance; and if the other driver was wholly or partly at fault, you may be able to collect additional expenses from him or his insurer. If you plan to make a claim, notify your own insurance company, the other, or both immediately (see opposite page).

Get duplicate, receipted bills for all payments you make as a result of the accident. Your collision policy will cover only approved repair and towing charges, less any deductible amount. But if you have a claim against the other driver, you may legitimately add necessary hotel bills, lost wages, car rentals, or other substitute-transportation costs, as well as damage to the

contents of your auto. You can, incidentally, take an income-tax deduction for any part of your actual accident loss that is not paid for by insurance.

If your car must be towed, find out the rates before you call a wrecker or allow him to hitch on. Some operators may try to pressure you into authorizing estimates or even repairs, so take time to read any "receipt" forms you may be asked to sign. Don't okay anything except towing until you've had a chance to find out more about the shop and facilities that are offered.

If you're far from home or just can't wait for an insurance adjuster before having your car fixed, try to get by with minimum repairs. Leave body work—usually the most expensive part of the job—until the damage has been inspected and an estimate agreed on.

In some respects you are between the jaws of a pincers. The lower you can keep repair bills, the easier you may find it to come to a settlement. But you don't want to cut it too fine, especially when you have a legitimate insurance claim. You are entitled to a first-class job, including replacement of parts that can't be properly mended. Anything less lowers the value of your car both while you keep it and when the time comes to trade or sell.

What are "necessary" repairs? In theory everyone agrees, but in practice there are almost sure to be some differences between insurance-company figures and your own. You may be able to negotiate some of them with the adjuster. If that doesn't work—and the argument is with your own collision company—your policy may permit

mind that the companies hold most of the trumps: You're always free to sue them, but it could take years to get a case to court. Since legal expenses would eat up a small claim (or the difference between what you ask and what they offer) you might have to drop the whole thing.

So it usually pays to follow the rules and avoid unreasonable actions or demands. If you then feel you're being treated unfairly, consult the complaint office of your state insurance department.

Do you need a lawyer?

THERE are at least two answers to this question. Insurance men point out that roughly 90 percent of all auto-accident claims are paid off without lawyers. But on the other hand a good attorney can almost always boost the settlement you'd otherwise get.

Whether he can boost it enough to increase your take-home pay is another matter. The lawyer who represents you in a damage suit or negotiation will probably work on what is called a "contingency" basis. Instead of charging you a flat fee, he'll take a percentage—generally between a third and a half—of what he can collect.

In a small car-damage case where there's a difference of, say, \$50 between what you ask and the insurance adjuster offers, there's not

much a lawyer can do. Even if he gets the full amount, you may end up with less.

But if the accident causes death, serious injury or substantial damage, it's usually wisest to have a lawyer press your claims.

The best time to engage him is right at the beginning so that he can protect your rights from the start, and gather evidence and interview witnesses while the events are still fresh.

If you need a lawyer, try to get one of the top accident men in your area. An experienced claims attorney will probably charge the same percentage as your brother-in-law's cousin who just got out of law school. But if he can take his cut out of a bigger pie, there will be more left over for you.

you to call in an independent appraiser. You'll have to pay half the fee and agree to accept his decision.

Claims under collision policies can usually be worked out without too much trouble, and payments are likely to be reasonably prompt. A major reason is that you're a customer as well as a claimant. To the liability adjuster, however, you are only a claimant and his primary job is to keep the settlement down—not to see that it's "fair" or that you get the best kind of repairs. He's well armed for the combat because he holds the purse strings. If you can't come to an agreement, you are free to call in a public appraiser—at your expense. The company need

not accept his judgment but such a step will probably strengthen your case if you decide to complain to your state insurance office—or sue.

Getting the job done right is up to you once an insurance company has approved the estimate of your repairman. So try to pick a good shop that will stand behind its work. When you're in doubt and time allows, it may be worth while to get two estimates before you even start negotiating with the adjuster. The estimate you agree on should detail each part to be repaired or replaced. When the job is done (or as it goes along) check off every item before you pay the bill.

Settling for Injuries

Claims for injury compensation are obviously much more complicated than those for property damage. If you are hurt in an accident for which the other driver is responsible, his insurance company might reverse its technique and try to hustle you into a settlement. It's not uncommon for adjusters to rush helpfully to the scene with checkbooks poised.

The joker is that you can't collect partial payment; to get the check you have to sign away your right to any further claim. *Don't*. If there's any possible way you can manage your finances without accepting a quick settlement, hold off until you—and your doctor—know the extent of the injury and the recuperation time, and whether you may have suffered any permanent or recurrent impairment.

What's the current market price on injuries? If the case goes to court, there's no way of telling (which is one reason some companies favor the small-, quick-payment method). In-

surance men say ruefully that juries have been getting increasingly generous—and cite awards like \$86,000 for a broken hip and \$150,000 for a fractured back. These, however, are well above the average. You might get a lot less—or nothing at all. And, of course, stiff legal fees stand between the jury award and what you actually collect. In many states, moreover, it takes years for accident cases to come to trial.

So it doesn't automatically figure that you'll want to make a lawsuit out of your injury, especially if it's relatively minor. How much smaller is a negotiated settlement than what you might sue for? There are no set standards, but many experienced observers say that, as a rule-of-thumb, you will have little difficulty collecting three times your actual costs. For example, if a broken arm costs you \$300 in medical expenses, and another \$500 in lost wages, a claim for \$2,500 would probably be considered fair.

Experts recommend

that you keep these items in your car for use in case of accident:

- First-aid kit
- Flashlight
- Folding rule or tape
- A list of your insurance-company offices
(supplied with most policies)
- Accident-reporting forms

On the following pages →

Paper work after an accident is important for your protection. Do it while details are fresh and still available. Fill in the blanks on pages 10-11, and you can copy the data later onto the official report.

Checklist

YOUR CAR

FILL in the first three blocks now so the information will be handy when you need it. The other driver is entitled to data listed above the dotted line.

Make _____ Model _____ Year _____

License no. _____ Serial no. _____ Engine no. _____

Registration (if not in your name) _____

INSURANCE

Your company _____ Policy no. _____

.....
Your broker, agent, or company representative

Name _____ Address _____ Phone _____

ACCIDENT REPORTS

(Check up now on local requirements)

State department to be notified Motor Vehicle Public Safety
Police Highways Sec. of State Other _____

Minimum damage that must be reported \$ _____ How soon? _____

City or county reports? _____ Forms available at _____

INJURED PERSONS

Names and addresses _____

Where taken? _____ How or by whom? _____

Doctor _____ Address _____

WITNESSES

(If possible, get names, addresses, license numbers or other identification. See page 3)

POLICE

(Check box at left if witness to accident)

Name _____ Badge _____ Precinct _____

Name _____ Badge _____ Precinct _____

Checklist

THE OTHER CAR

If more than one car, get same data for each

Driver's license no. _____ Name _____
Address _____ Age _____
Owner's name if different _____ Address _____
License registration no. _____ State _____
Capacity no. _____ Policy no. _____
Car make _____ Model _____ Year _____
Engine no. _____ Serial no. _____
Damage _____

OCCUPANTS

List all check box if each injured or received medical attention

Name _____ Address _____
 Name _____ Address _____
 Name _____ Address _____
 Name _____ Address _____

DETAILS OF THE ACCIDENT

Date _____

Time _____ AM _____ PM _____

Weather _____

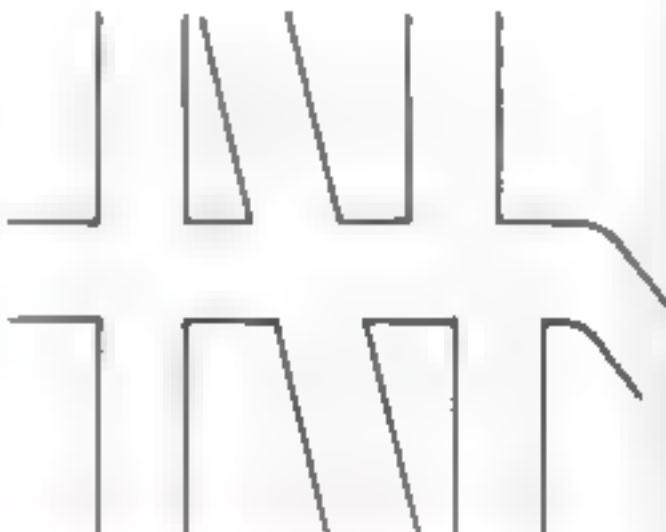
Street or road note type of surface wet or dry,
straight level graded etc.

Any traffic control light stop sign etc?

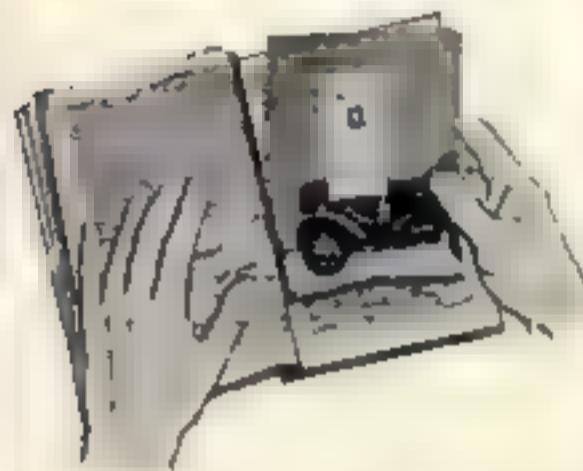
Were your headlights on?

Did you blow your horn?

Where and how? On diagram below indicate streets direction, where cars were,
which way headed distances from curb,
etc. If necessary draw your own diagram



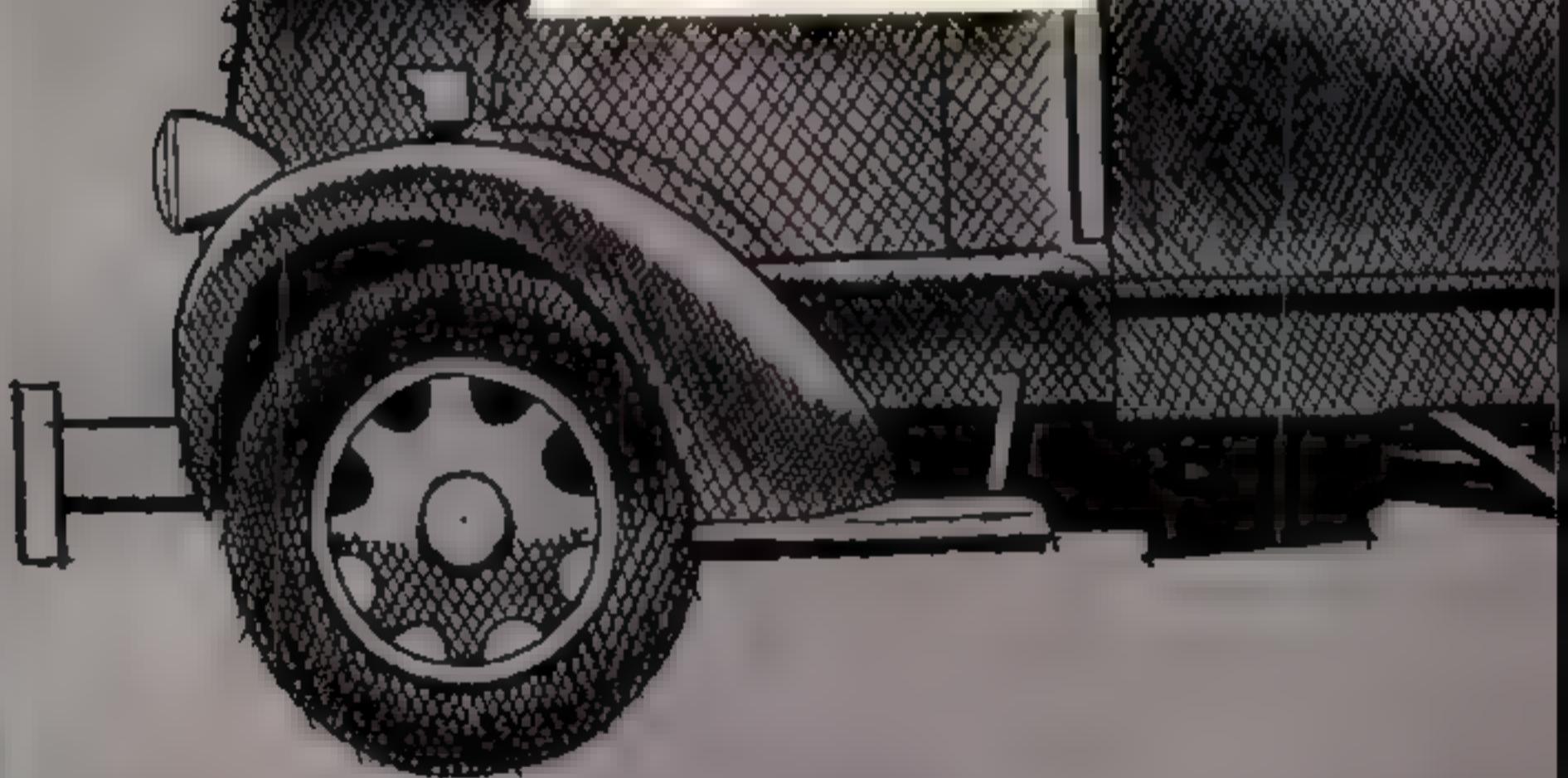
P.S. EXTRA:
YOUR TEAR-OUT
BOOKLET NO. 10



To remove this booklet,
place your left hand on
the facing magazine page,
grasp the booklet with your
right, and pull it gently away.

After you've read the
booklet, put it in your glove
compartment.

July 1958
POPULAR SCIENCE

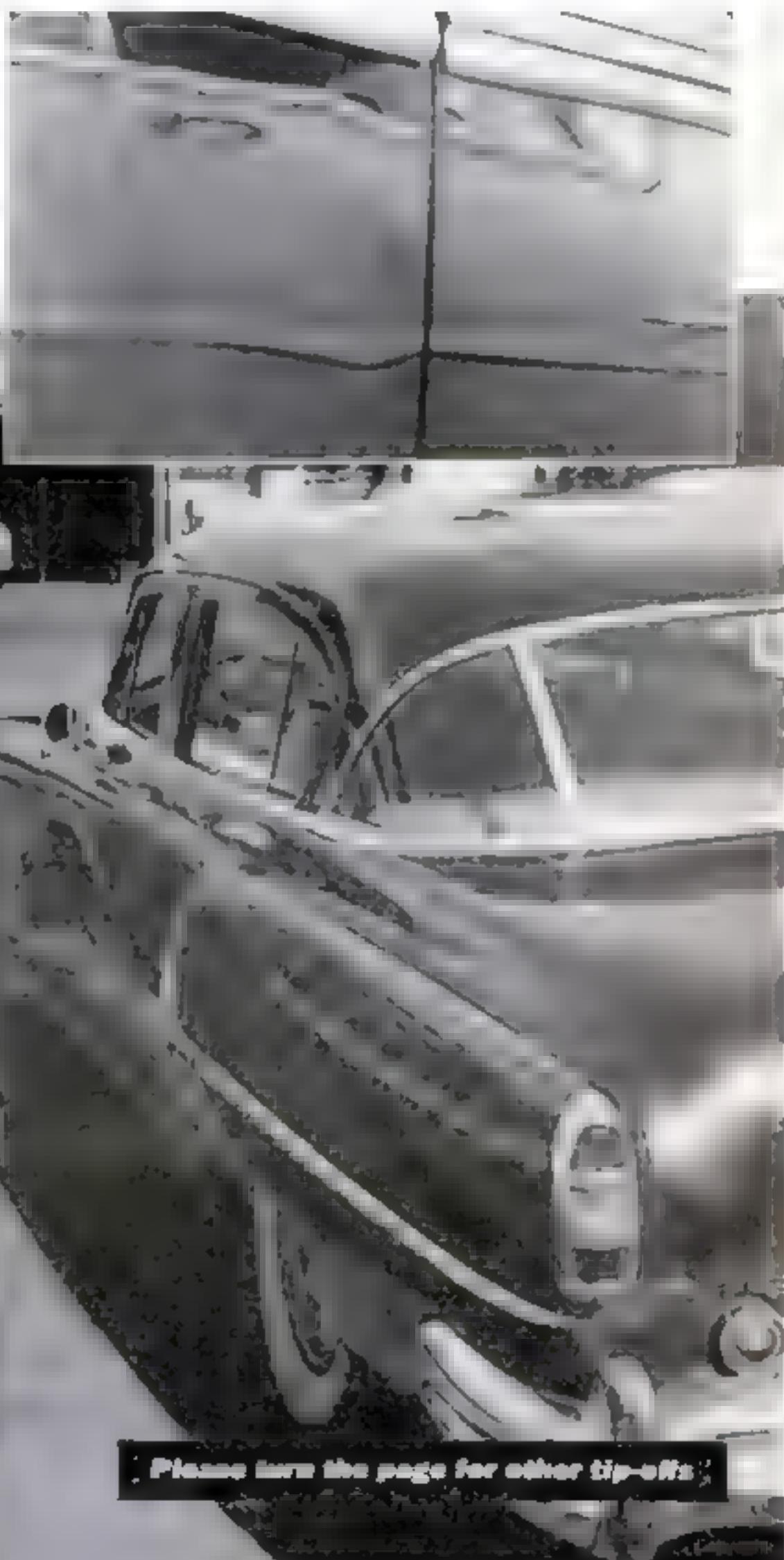


5 Tip-Offs to a Good Body Job

Checks used by pros tell you whether or not you're getting the first-class repair job that you asked for. The photos show you where to look, and what you should NOT find

1 Panel reflections

SIGHT ALONG THE SIDES of repainted panels. They should mirror objects without wavy distortions. Reflections like those pictured in inset (right) are tip-off to dents that have been poorly reworked or filled, if at all.



Please turn the page for other tip-offs.



2 Trim alignment

CHROME SHOULD LINE UP, whether a door is hanging free or latched. In a good repair job the hinges are adjusted and the striker plate so placed that the up or down shift of the door is less than $3/16"$ when the lock engages.

LACK OF ATTENTION TO ALIGNMENT here, while not serious, is the stamp of sloppy body work. All chrome molding has adjustable clips or mounts, and the corner decoration should have been refitted to match the hood trim.

4 Chrome-work finishing



SCRATCHED AND BATTERED BUMPERS should be straightened out; in a first-class job they're also ground smooth and replated bright as new. Check for missing bolts; if a bumper breaks loose you may be in for real trouble.

SANDER MARKS THAT MAR CHROME, as below, also show that the trim was not removed, as it should have been, to get at adjacent peeling paint. Note sander marks on the new paint, too; body putty wasn't used to level them.





3 Seams and hinged joints

PANELS THAT HAVE BEEN TACK-WELDED out of alignment may prevent a hood or trunk lid from ever closing properly again. Wide gaps at the seams are an invitation to leaks and rust. Note poor body-putty work in the horizontal seam.



POOR SEAM AND HINGE FITS like these are inexcusable. There's a wide gap between the hood and the cowl, the fender has been placed too far forward, and the door has been rehung too close to the frame for adequate clearance.

5 Repainted areas

LOOK FOR CRACKS AND BLISTERS—they'll turn up quickly if the metal underneath was not properly prepared. Spots of grease or silicone polish, to which the new paint couldn't bond, account for the peeling surface on this car.

SPRAY GUN HELD TOO FAR AWAY from a re-worked door panel produced the dull finish shown here. Except on old, weathered cars, you should expect an almost perfect surface match. That goes for color matching, too. END

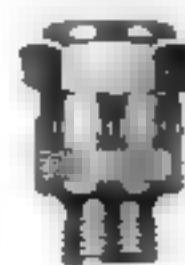




Stock cars streak around turn at Daytona Beach. In the past 5 years
Champions have powered 337 out of 353 NASCAR winners!

Q. Why do 9 out of 10 stock car winners use Champion spark plugs?

A. Champions give full-firing power.
Put new Champions in your car every
10,000 miles. You'll get an immediate boost
in horsepower...and save gasoline, too!



World's favorite spark plug—engineered for every car built by Ford, General Motors, Chrysler, American Motors, Studebaker-Packard, and every major foreign maker

CHAMPION

Pointers on Washing the Inside of a Car

By Herbert O. Johansen

"**M**A'AM, you've got the sweetest-smelling car in the neighborhood," said the garage mechanic, sticking his head out of the door of our car while he was making an adjustment on the turn signal.

A STICKY STEERING WHEEL can be cleaned in a jiffy when you have a suds solution handy.

My wife appreciates a compliment, but this was a new approach

"Hope you didn't mind what I said," he apologized when the job was finished. "It's just that some folks keep their cars clean as a whistle outside where other people can see it, then forget the inside where they have to live with it." He shook

While you are at it, do the dashboard, door-knobs, handles, sun visor. Rinse and dry them.





DRY SUDS are made by whipping up a good handful of soap or detergent in two tablespoons of water until you have a stiff lather about the consistency of a frozen custard.

his head. "It doesn't make sense to me."

The inside of our car has been "clean as a whistle" ever since we realized that most of the interior of today's automobiles is covered with plastic or man-made fabrics that can be washed with plain soap and water or shampooed with "dry" suds. So now, when our car is due for a spit-and-polish job on the outside, we start by cleaning and washing the inside.

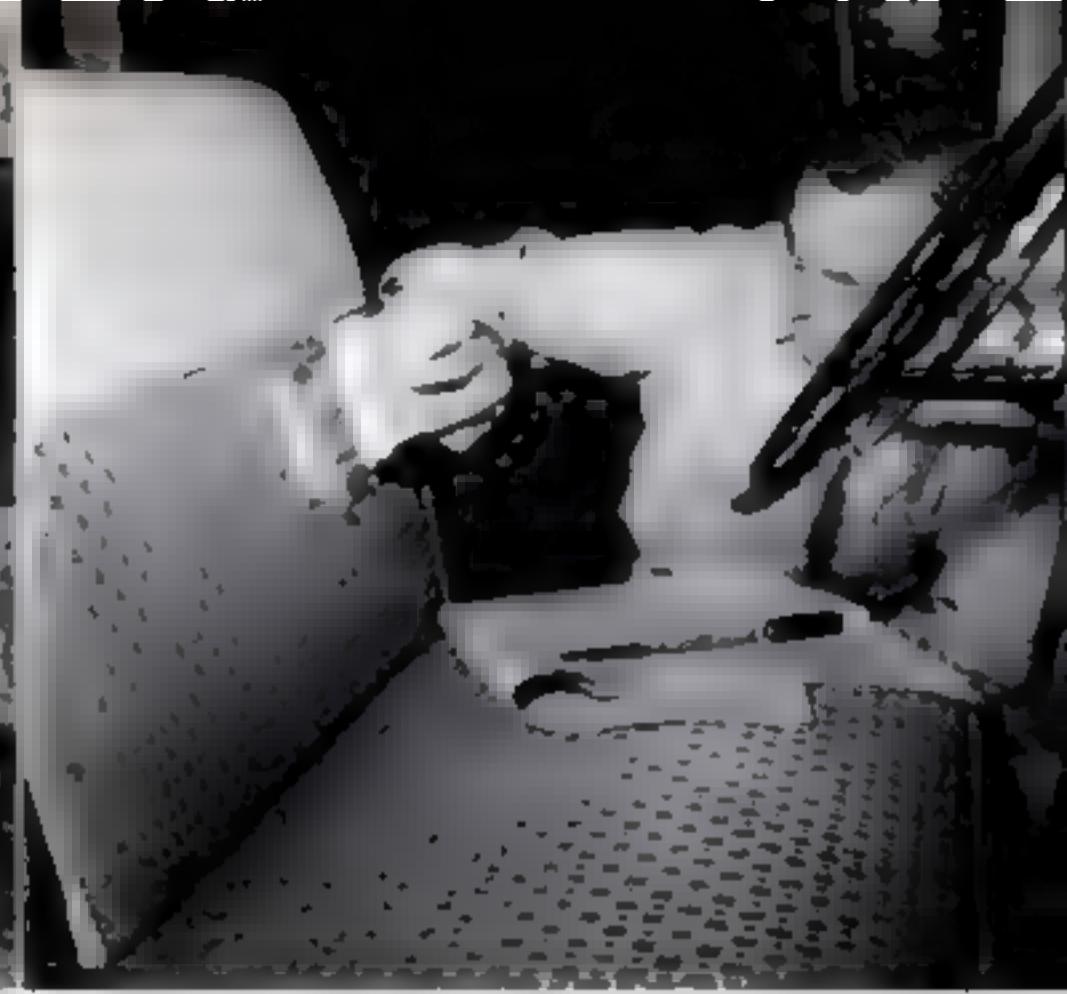
First we remove the plastic seat covers and vacuum the upholstery, cleaning up the rest of the inside while we are at it, brushing the floor and emptying the ash trays. The trunk gets housecleaned, too.

Then we go to suds, starting with the plastic ceiling. Using a sponge we apply a thick lather with a circular motion, doing small sections at a time, rinsing each with water and wiping dry. All other plastic surfaces get the same treatment.

Next comes the seat fabric, on which we use "dry-sudsing," as shown in the photographs above. Where the color has dulled, we have had good luck in restoring it by adding a tablespoon of ammonia to the suds.

(Warning: Do not use a suds-wash on felt or heavy-napped fabrics, which are apt to buckle. These should be cleaned with a special dry-cleaning solution.)

After that, we tackle the plastic seat covers, finish by giving the outside a thorough wash and polish—and we're clean, from the inside out.



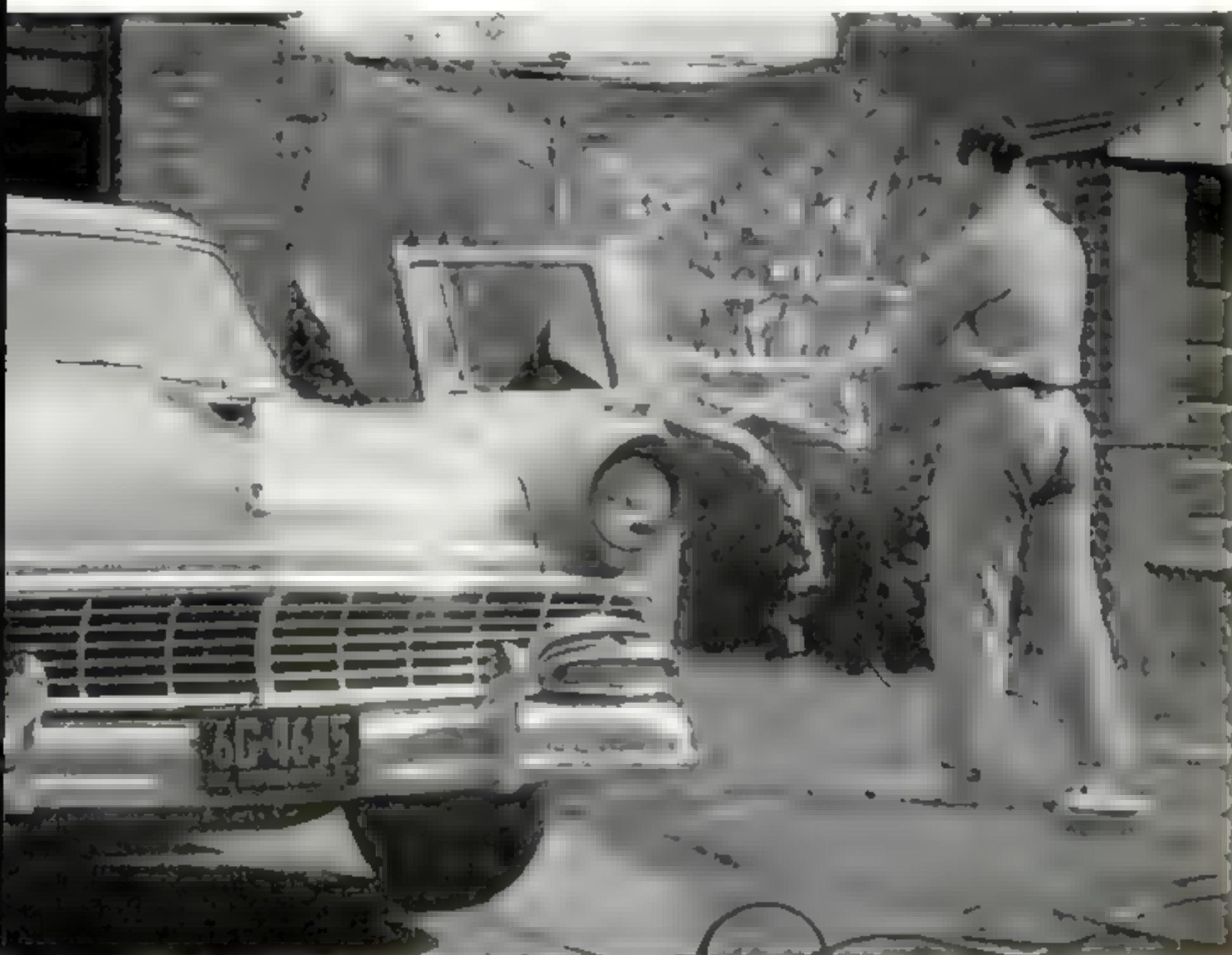
APPLY THE DRY SUDS to upholstery with a sponge, either natural or synthetic. Lay it on gently with the grain of the fabric, working small areas at a time. Don't rub suds in.





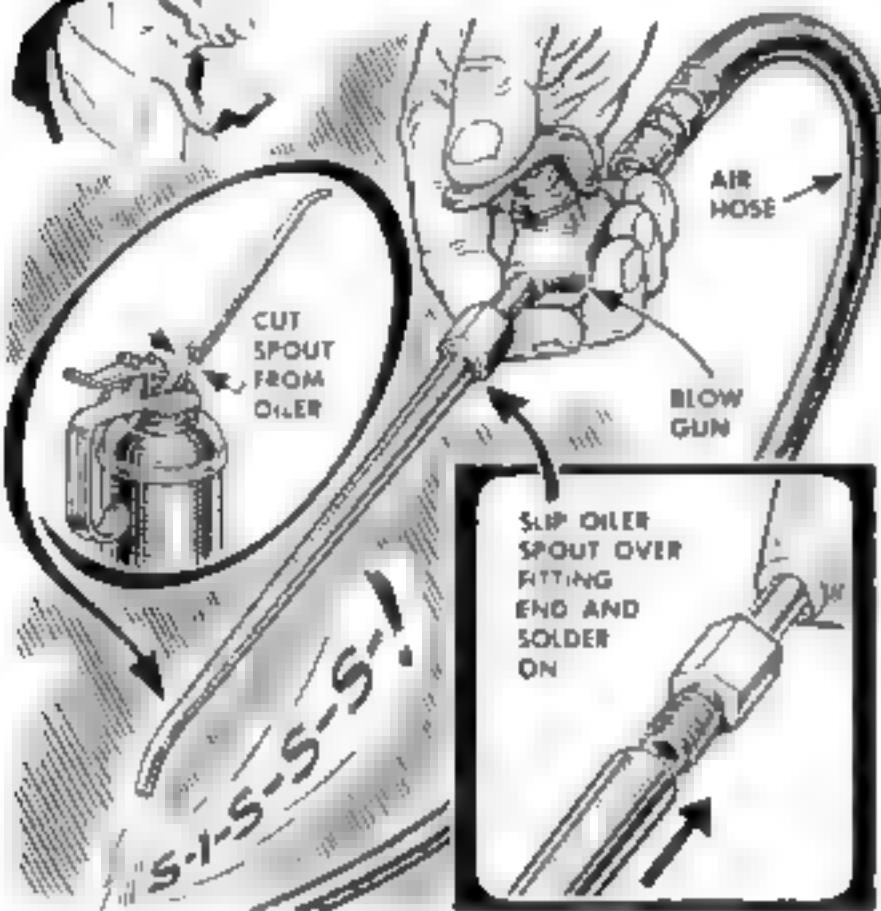
LEAVE THE SUDS ON for a few minutes to loosen and take up dirt. Then scrape off the lather with a spatula or the dull edge of a knife, and flick it off on a piece of newspaper.

WIPE THE AREA with a clean sponge that has been wrung out in clear water. When you work on the next section, overlap to prevent streaking. Don't use the discarded suds again.

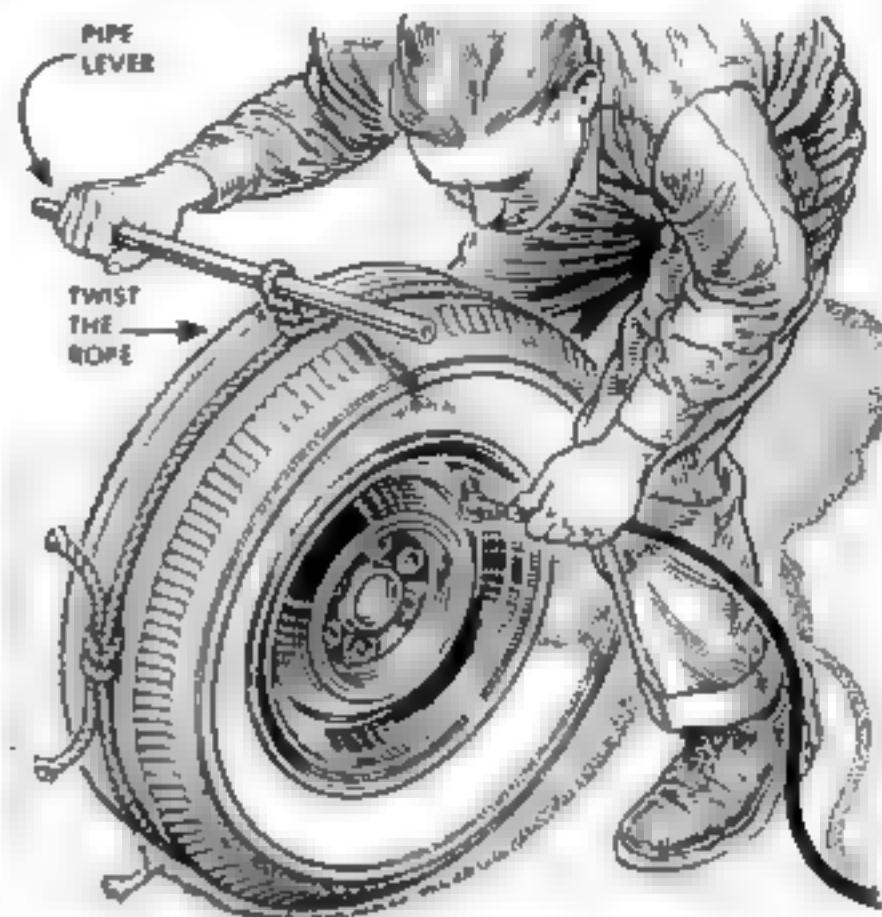


WITH INSIDE OF CAR CLEAN and drying, the plastic seat covers get a soap-and-water bath while hanging on the clothesline. Then they are hosed down with clear water.

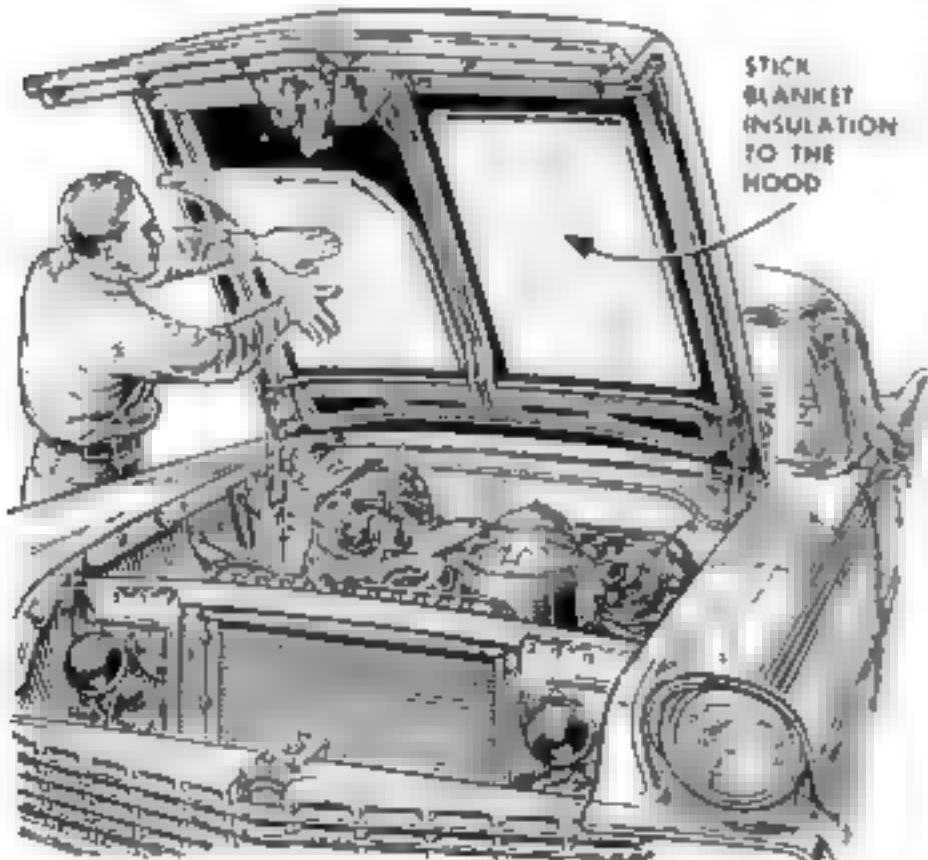
Hints from the Model Garage



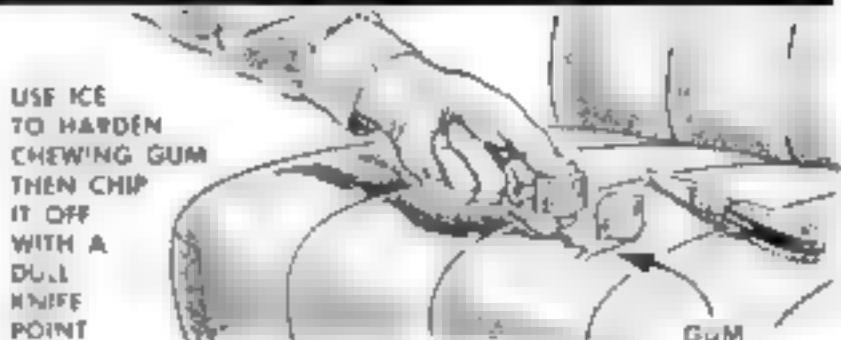
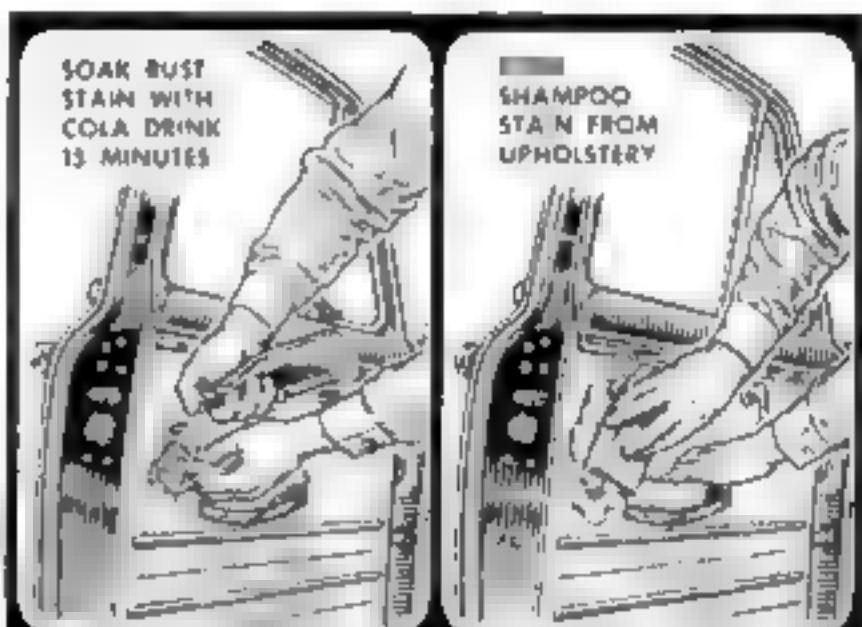
For blowing out dust from inaccessible places, solder the spout from an old oil can to a brass coupling that fits the blow-gun nozzle. You can then use the gun for normal cleaning operations and quickly attach the spout for a long reach.



Repair your own tubeless tires? You can seat the beads against the wheel rim so they'll hold air by applying a rope tourniquet around the tire. When partial inflation expands the tire, remove the rope and inflate to recommended pressure.



Make your own hood liner from blanket-type glass-fiber insulation sold by the yard at lumber yards. Cut the insulation to fit the underside of the hood, apply body undercoating to the metal, and immediately press the material in place.



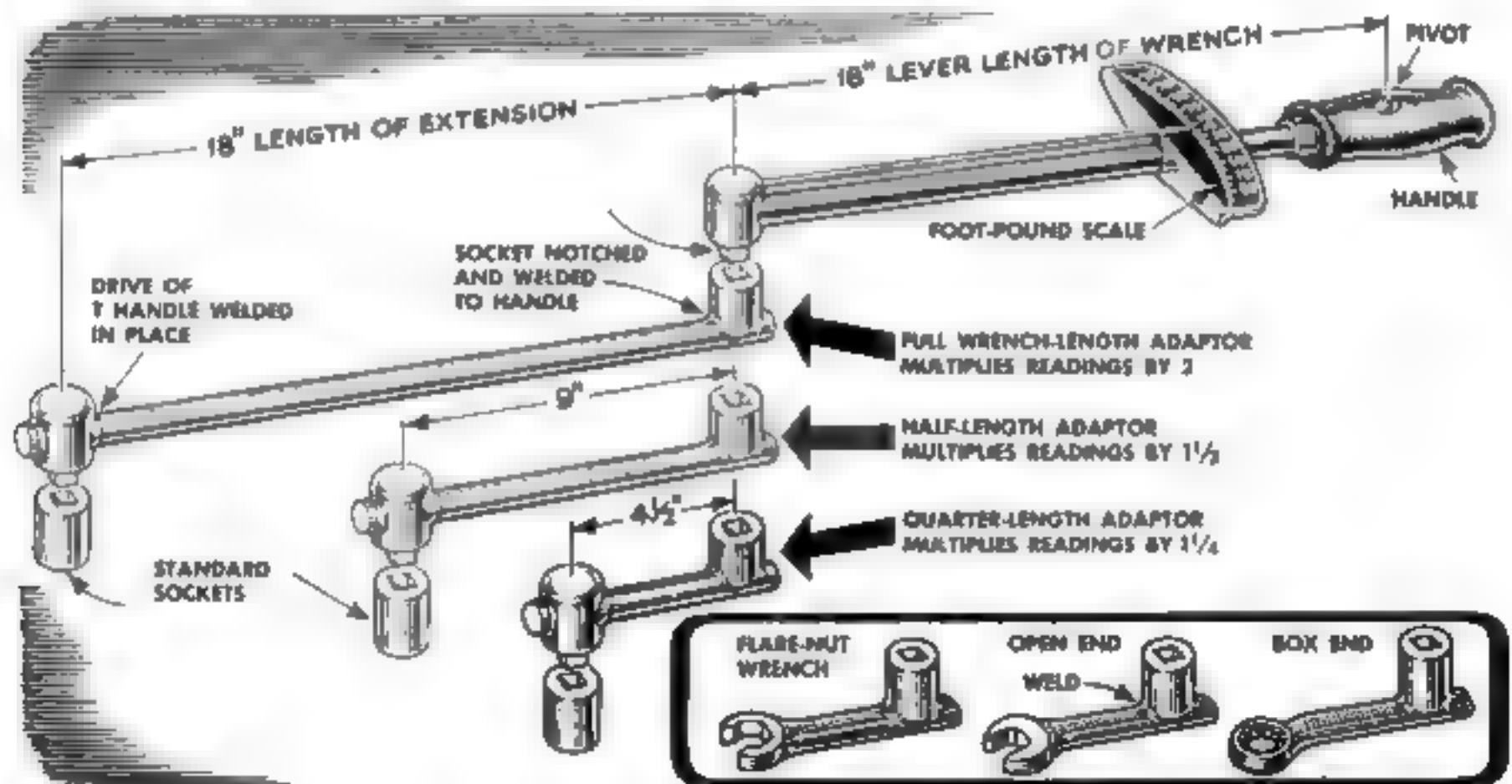
To remove rust stains or chewing gum on upholstery one motorist uses cola drink and ice cubes. He soaks rust spots with cola, then shampoos the area after allowing it to act. Gum is hardened by chilling, then chipped off with a knife.



Hubcaps will stay new-looking if you remove them occasionally and wash and buff them. Use a lamb's-wool polisher in an electric drill to brighten the chrome, and finish off with a protective coat of paste wax buffed to a high polish.



Check the oil yourself? Keep your oil-pouring spout clean and ready to use by storing it in a plastic bag. Besides keeping dust and insects out of the spout, the bag will collect oil drippings, preventing a mess in the garage.



One torque wrench can be made to do the work of several. Just use wrench adaptors that can increase its capacity up to double the calibrations on the scale. An adaptor or extension arm equal to the lever length of the wrench will multiply the torque by

two; thus a 100-foot-pound wrench can be used to tighten bolts up to 200 foot-pounds. Shorter adaptors increase the range proportionately as shown. Adaptors with open or box ends (lower right) also extend the usefulness of the wrench.

Gus Faces a Low-Down Charge



By Martin Bunn

WHEN Verle Graham and Don Holt drove Don's middle-aged coupe into the Model Garage, their conversation wasn't intended for the ears of its proprietor, Gus Wilson. But, working quietly behind a car, Gus couldn't help hearing every word they said. A wry grin moved over his face.

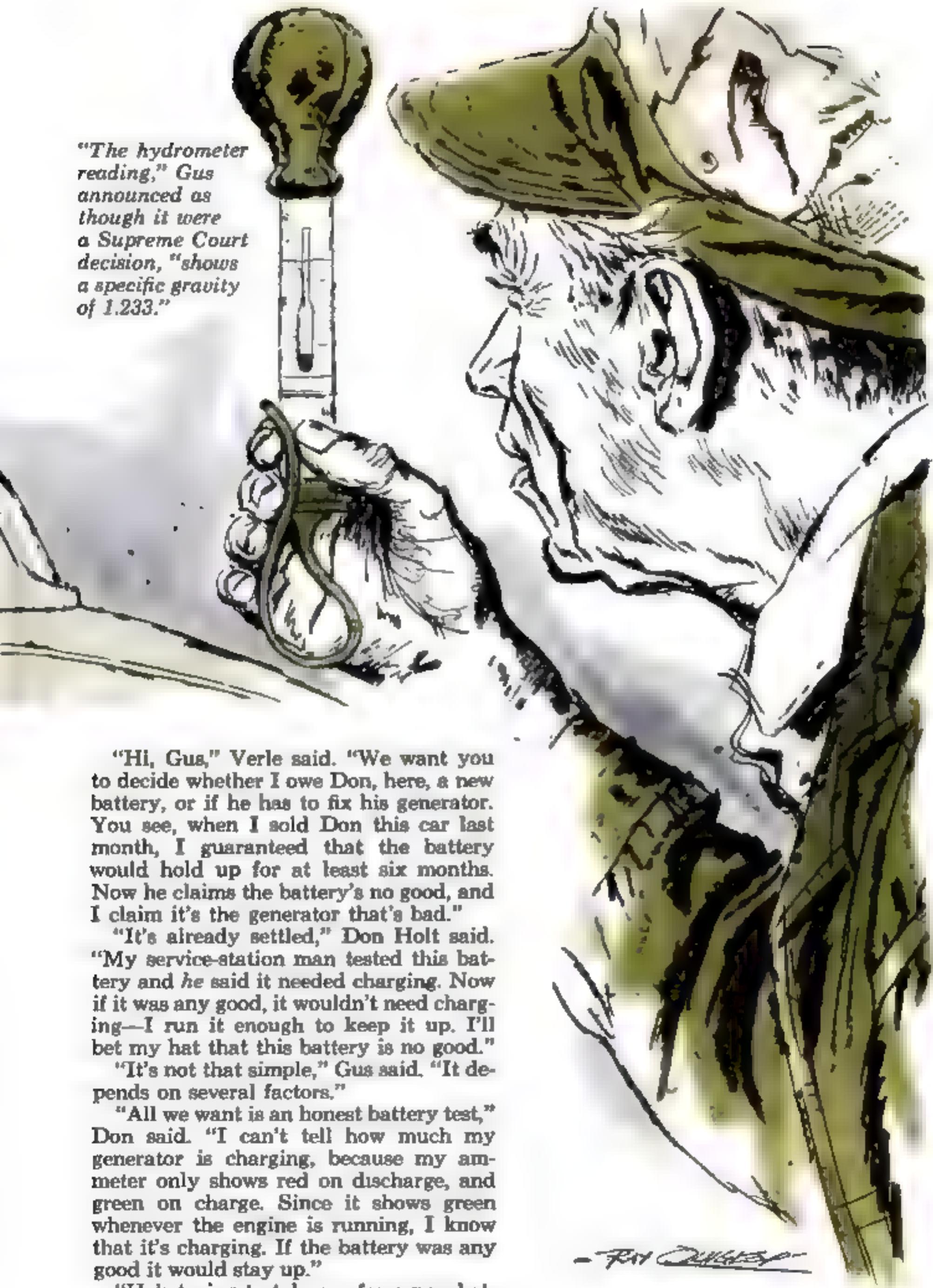
"What kind of a sucker do you take me for, Verle?" Don Holt asked heatedly. "The service-station man said you owed me a new battery. You've known this old character, Gus Wilson, all your life. I don't know him from Adam's off ox. A fine break I'll get here."

"Just because Gus Wilson is a friend of mine won't make any difference," Verle retorted. "He'll be square with us both."

Gus slipped quietly from the far side of the car, moved around a couple of other vehicles, and stepped into view.

"Hello, boys," he said. "What's your trouble this morning?"

"The hydrometer reading," Gus announced as though it were a Supreme Court decision, "shows a specific gravity of 1.233."



"Hi, Gus," Verle said. "We want you to decide whether I owe Don, here, a new battery, or if he has to fix his generator. You see, when I sold Don this car last month, I guaranteed that the battery would hold up for at least six months. Now he claims the battery's no good, and I claim it's the generator that's bad."

"It's already settled," Don Holt said. "My service-station man tested this battery and he said it needed charging. Now if it was any good, it wouldn't need charging—I run it enough to keep it up. I'll bet my hat that this battery is no good."

"It's not that simple," Gus said. "It depends on several factors."

"All we want is an honest battery test," Don said. "I can't tell how much my generator is charging, because my ammeter only shows red on discharge, and green on charge. Since it shows green whenever the engine is running, I know that it's charging. If the battery was any good it would stay up."

"He's trying to take me for a new battery, Gus," Verle Graham warned. "His

- Roy Crandall

pal at the service station said that a battery should have a specific gravity of at least 1.235. He claims this one tests only 1.233. Imagine, trying to stick a guy over two measly points."

"It isn't just a matter of two points low," Don Holt protested. "It's the fact that 1.235 is the lowest a good battery should get."

"You're getting me confused with this point business," Gus said cheerfully. "Let's get this straight. Your service-station man claims that your battery should have a specific gravity of at least 1.235 with a sound generator. Since it tests two points lower than this, you want Verle to back up his six-month guarantee with a new battery."

"Right," Don declared.

"I guess that's it," Verle said slowly. "If the battery is bad, I'll buy a new one—but Gus, you'll have to give me two or three months' credit on it. Right now I'm flat."

GUS winked at Stan Hicks as he got a hydrometer from the bench, thrust it into the battery, filled it, held it up to take a reading. He repeated this action in the other two battery cells.

"The hydrometer reading," Gus announced as though it were a Supreme Court decision, "shows a specific gravity of 1.233."

"There," Don said triumphantly. "With your own mechanic backing me up, Verle, you'll have to come to terms now."

"Not so fast," Gus said. "Since you two have put me on the spot as to who is going to pay for what, let's not jump to any hasty conclusions. This is a hot day, I'd say near a hundred in the shade. I'll bet the electrolyte in this battery is about that hot. You can't go by what a hydrometer tells you, unless the electrolyte stands at a true testing temperature of 80 degrees Fahrenheit. For every five degrees below 80, the hydrometer reading is false by two thousandths high. For every five degrees above 80, the hydrometer reading is off by two thousandths low, or as we call it, two points low."

"What!" Don's youthful features were indignant. "What kind of double-talk is this?"

Gus got a long, thin thermometer, thrust it into the battery, left it there a long minute and took a reading.

"The temperature of this battery's electrolyte," he announced, "is 90 degrees Fahrenheit. Since this is 10 degrees, or two fives, above a true testing temperature of 80 degrees, our hydrometer reading is four thousandths low. Therefore, the true specific gravity of this battery is 1.237."

"Holy cow!" Verle Graham exclaimed. "That lets me out, Gus."

"So that's why you insisted on bringing the car here," Don Holt said bitterly. "Nice deal, juggling figures and temperatures to beat me out of my battery guarantee. Wait till I tell the fellows out where I live about this. I'll bet my hat this garage won't get any more of their repair business."

"That's twice you've bet your hat on this job, Don," Gus said quietly. "I'm willing to give your battery a voltage and a breakdown test to prove my point. This battery is probably all right."

"Maybe," Don retorted. "But I'm not as dumb as I look. A battery can seem all right in all these tests, but still not be able to take and hold a full charge. Tell me, if this battery is all right, why won't it turn my engine over as it should? Why does my car start hard?"

"Maybe I'm wrong," Gus said calmly, "but I don't recall your mentioning any such troubles when you came in. Suppose you show me."

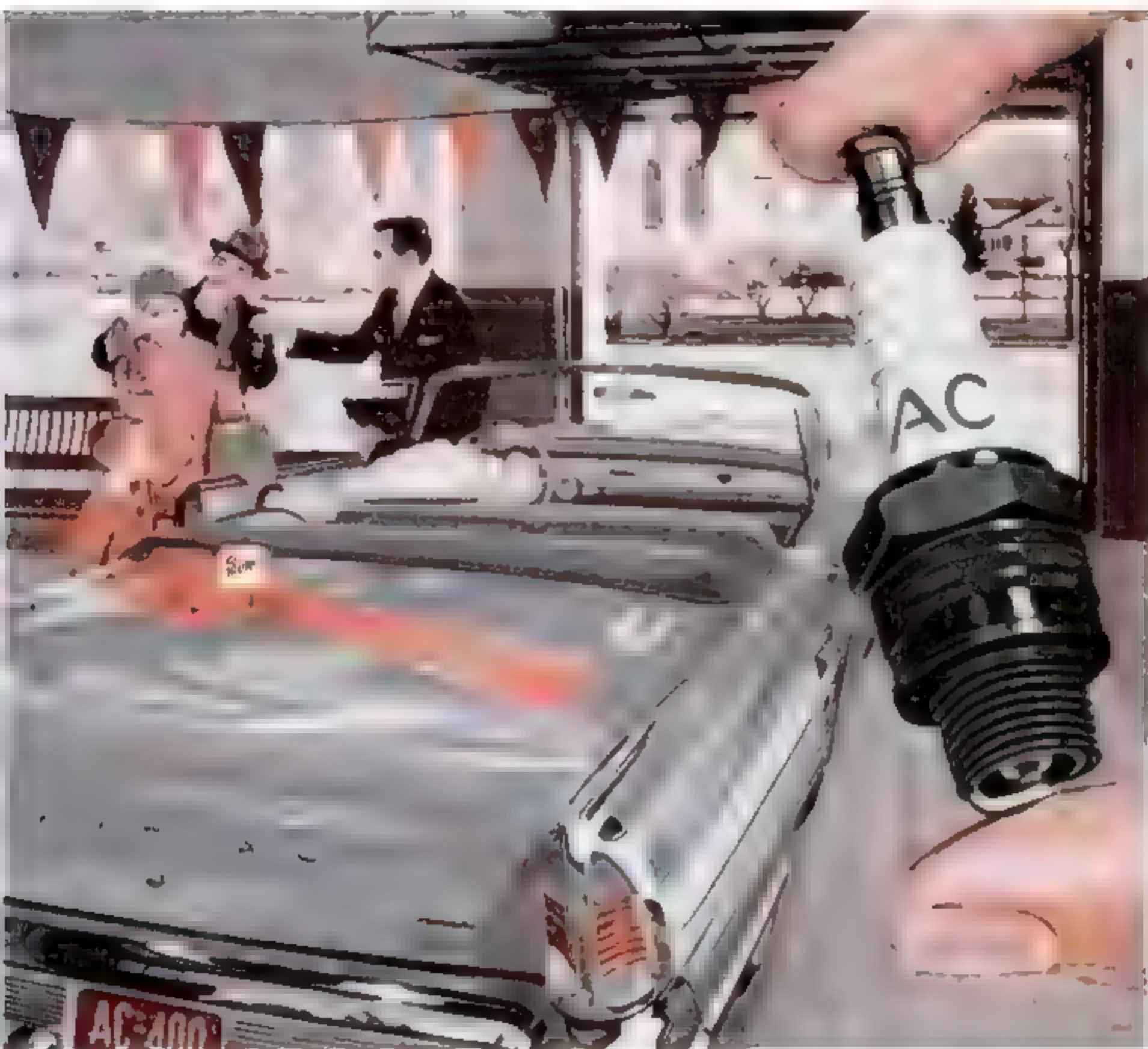
THE youth slipped behind the wheel, stepped on the starter. The engine turned sluggishly, didn't start until the starter switch had been held closed for more than half a minute. "I suppose you call that a good battery," Don said.

"I'd call that a badly worn bushing in the rear housing of your starter assembly," Gus replied.

"Starter assembly!" Verle crowed. "Do you mean to tell me that the trouble isn't in the generator at all?"

"And why not?" Gus asked. "Don said that the ammeter showed green when the engine was running. When I took the caps from the battery cells I could see bubbles rising in the electrolyte, which indicated that the generator was throwing a good charge into it when you drove in here. From the sound of things I'd say that the starter is running in a bind from a bad bushing, letting the armature strike the field coils with every turn. This robs the

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ACTION
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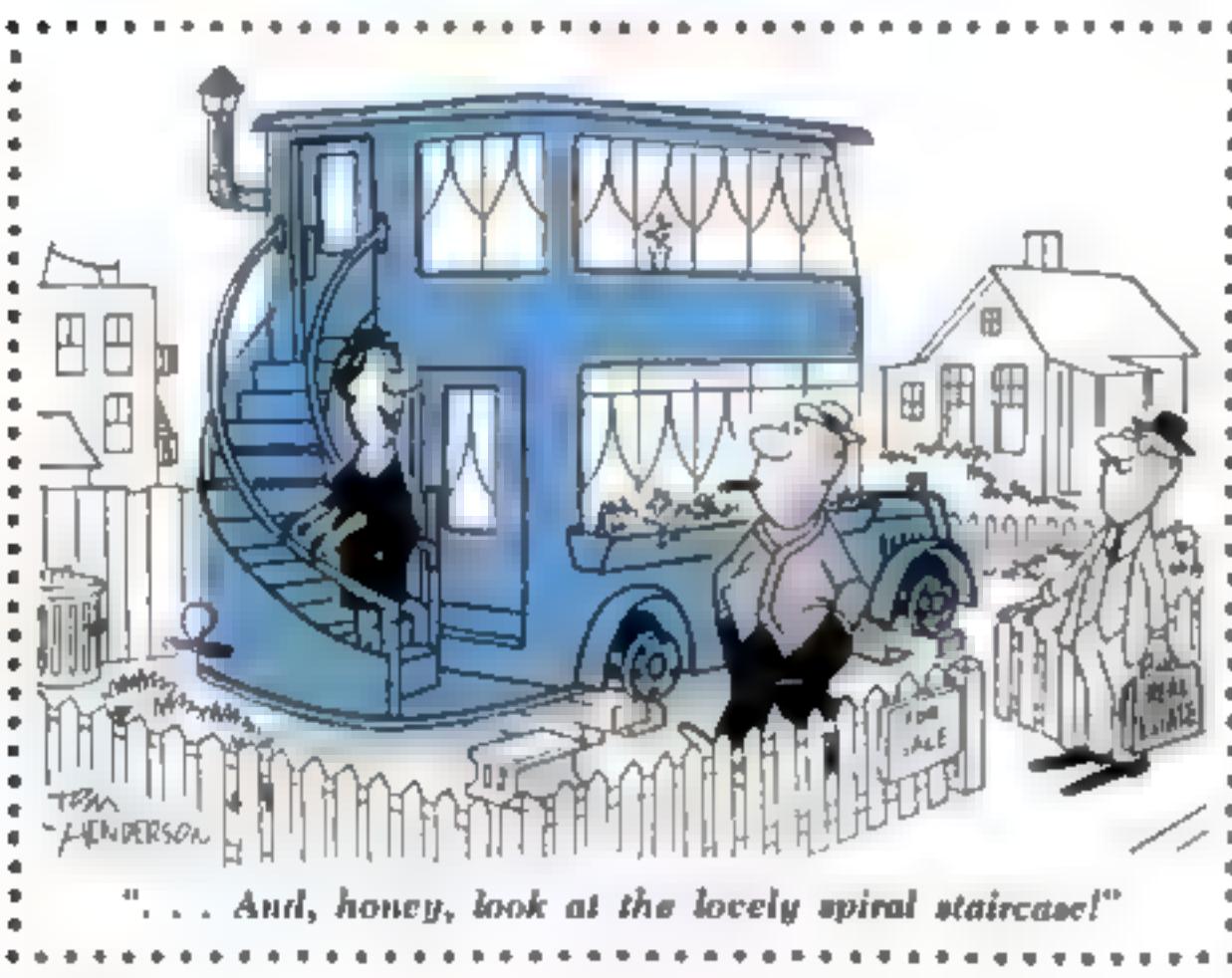
HOT TIP
SPARK PLUGS

Watch Walt Disney Studio's ZOMBO
every week on ABC-TV

primary ignition circuit of juice, producing hard starting. With this engine taking so long to start, it would take a pretty good battery to hold up to even where this one is, with the kind of stop-and-go driving most of you young fellows do. Here, I'll show you."

SWIFTLY Gus removed and disassembled the starter. He removed the rear casting, drove out its armature-shaft bushing, installed a new one, ran a reamer through it, reassembled and installed the unit.

"Try it now," he said.



"... And, honey, look at the lovely spiral staircase!"

This time when Don stepped on the starter, the engine fired instantly.

"Well, I'll be darned!" Verle exclaimed.

Gus dug out his pipe, filled it and lit up. "You boys sort of put the cart before the horse when you came in here," he said. "You didn't ask me to tell you what was wrong—you told me. You asked me to judge between a bad battery and a bad generator. Next time, tell the mechanic your troubles and let him do his own thinking."

THIS way it turns out," Don Holt said slowly, "is that I have to pay for fixing the starter. How much do I owe you, Mr. Wilson?"

"Well," Gus said, "there's just about enough rubbish piled behind the garage to fill the rear deck of this coupe. Tell you what I'll do. If you'll haul that rub-

bish to the city dump on your way home, I'll call it square. Does that sound fair?"

"It sure does," Don said enthusiastically. "I guess I was wrong about you, Mr. Wilson, just like Verle said I was when I got to shooting off my mouth."

"After all," Gus said, and his eyes twinkled, "you didn't know me from Adam's off ox."

Don Holt's face reddened. "I'll bet he heard every word we said when we first came in."

"Who, me?" Gus said. "Why, an old character like me can't hear anything."

"What I keep asking myself," Stan said, after the boys had left, "is what condition you would have said that battery was in if this had been a zero-weather day, with the electrolyte standing at, say, 35 degrees, and the battery showing a hydrometer test of 1.233, as this one did."

"In that case," Gus commented, "I'd have had Verle Graham on my credit books for a new battery. Even though I was sort of kidding the lads along, this temperature business in a battery test is really the straight goods. A battery with

a specific gravity of 1.233, on a normal hydrometer reading, with the electrolyte standing at 35 degrees, would have an actual, corrected reading of 1.215—which would really be a dead one in the eyes of those youngsters."

"Those kids had you in a bind," Stan said. "I was wondering how you were going to squirm out of it without getting one or the other sore at you. I never saw you use a thermometer on a battery test before."

"I never found myself arguing two points of specific gravity before," Gus said. "With the decision hanging on such a tricky technicality, I felt that I'd better get just a little bit technical myself, that's all."

"Well, you sure did, Professor Wilson," Stan chuckled. "You sure did."

END
Next month: Gus teaches fair play.



"Hast thou found me, O mine enemy?" shouted the struggling man.

A bomb scare at the airport lends drama to a fix-it job involving

TV's Big Troublemaker Circuit

By Art Margolis

WHEN your TV set acts up, the tube most likely to need replacement is the horizontal-output tube. Even if the trouble isn't tube failure, the horizontal-output circuit is still a frequent source of trouble. The reason is simple—it's the hardest-working circuit in the set.

Most circuits do just a single job. The horizontal output is loaded down with other tasks besides the one from which it gets its name—spreading the picture sideways. It provides:

- Sync pulses that are fed back to a circuit that keeps the

TALES OF A TV REPAIRMAN

horizontal oscillator in step with the transmitted signal.

- Keying pulses for the automatic gain control.

- Energy for the high voltage that gives screen brightness.

- Filament voltage for the high-voltage rectifier.

- Bias voltage, in more recent sets, for the vertical-output circuits.

Because of these many duties, trouble symptoms can take as many guises, making it tough on the repairman.

THREE'S one case I'll never forget. I was working on a set at our airport when two terminal guards escorted the wild-eyed mad bomber through the passenger lounge. He was shouting, "Hast thou found me, O mine enemy?"

An assistant manager came over and told me about it.

"Caught him trying to smuggle an infernal machine aboard Flight 107," he said. "Dropped his suitcase going up the steps and it broke open. That's not mine! Where is the Word?" he yells." The manager snorted. "The Word! You should have seen the tubes and wiring in that bag!"

I was shocked, remembering the headlines after a recent mid-air time-bomb explosion that had killed more than 40 people. The man looked like a Hollywood version of a villain, all right. He had been watching me until his flight was called. When he left, he was quoting the Bible at me, something about "Remember the end and thou shalt not go amiss." Well, it was none of my business. I shrugged my shoulders and went back to tinkering with the set.

"How's it coming?" asked the manager.

"Should have a picture for you in a minute," I said. When I had first turned the set on there was a picture, but it was like pulled taffy at one side and folded over at the other, with a fat white streak down the center.

It was an extreme case of horizontal foldover, in which the horizontal sweep signal—a voltage that rises and falls—is distorted. When viewed on an oscilloscope, this voltage, delivered by the horizontal-output circuit, is sawtoothed.

The output circuit takes a small saw-

tooth voltage and amplifies it for horizontal scanning. From the output circuit, the amplified saw is matched into the horizontal yoke, and the varying voltage induces a varying magnetic field around the yoke. Since the yoke is mounted around the picture-tube neck, it affects the cathode ray. The moving magnetic field pushes the cathode ray in sawtooth fashion, scanning from left to right, slowly, then whipping back to the starting spot to scan the next line.

As long as the sawtooth retains its shape the horizontal cathode-ray scanning takes place normally. In this TV, however, the saw shape had become distorted, and the messed-up sweep was causing horizontal foldover.

Starting with a voltmeter check of the horizontal-output stage, I found low voltage on the screen grid—30 volts instead of 200. Somewhere 170 volts were missing. Since the voltage had to pass through the 8,000-ohm screen grid resistor, I turned off the TV and measured it. The ohmmeter needle read 300,000 ohms! This resistor had increased in value, absorbing the missing 170 volts. I had been replacing the faulty resistor when the bomb excitement broke out.

"That should do it." I said to the assistant manager, making a final adjustment and switching the set on. The screen filled with a sharp, clear picture. "Your troubles are over."

"That's what you think," he said as we heard the screeching of police-car sirens. "Want me to help you move the set back in place?"

"Wait till I check the tubes." It wasn't really necessary. I guess I just wanted to show off my pride and joy, a homemade tube checker. I pulled over the old suitcase in which it was mounted and released the catch.

"Say," the manager said, "that's just like the suitcase that man . . ."

He stopped and we both looked down. Out of my open suitcase spilled a mess of literature—religious tracts. Then I saw a printed identification tag pasted inside. I was on my feet and dashing madly across the passenger lounge.

"Stop!" I hollered. "Hold everything! He's innocent! That's my tube checker he's got!"



I Outsmart Myself

MR. AND Mrs. Mercer taught me a lesson. When he opened the front door of the big house to my ring he kept it on the safety chain until I had introduced and identified myself. As I stepped into the entrance hall a mousey little woman darted behind his back: Mrs. Mercer. They were both very young.

"We're sorry to trouble you," he apologized, "but our TV set has been getting worse and worse all week."

"Why didn't you call me before?" I asked. "TV trouble is my business."

"Yes, sir," said Mr. and Mrs. Mercer in toneless unison.

I spied a 21-inch set in a parlor off the hall and, without waiting for an invitation from my shy pair, I went over and turned it on. The picture came in fine. Then a black border appeared, and, as I watched, the picture shrank until there was a three-inch border all around. Suddenly the picture blew up like a balloon, dimmed, and finally darkened.

"Mr. Margolis," came a timid voice, "there's something I want to explain . . ."

"Nothing to explain," I said. "You two just relax. I'll take care of everything."

The couple went into a whispered conference as I began to examine the set.

Before turning it off I noticed that the plates of the horizontal-output tube were cherry red. That gave me a clue.

One function of the horizontal-output circuit is to provide 10,000 volts. This acts as an attraction voltage, which pulls the cathode ray against the phosphor screen to cause light. When this voltage is low, it loses control of the cathode ray, the sawtooth sweeps too far, and the picture appears to bloom.

With the set on again and my voltmeter probe on the horizontal-output screen grid, the meter read way above the prescribed 200 volts before the set even warmed up. Then it dropped down to a 150 reading. I diagnosed the trouble as a shorted screen-grid resistor. This caused extra current drain, which also lowered the efficiency of the entire set, resulting in shrinking and blooming. Sure enough, the resistor measured 400 ohms instead of its prescribed 10,000. A new resistor made the fix.

"There you are, good as new," I said.

"The landlady will appreciate that," said Mr. Mercer.

"You see," added Mrs. Mercer, "we only board here. The TV set we called you about is a portable one in our room."



How I Got a Trimming

MY FRIEND Hank Bagley now lets out a wolf whistle every time I come into his TV-parts store to place an order.

It began in the beauty shop across the street. I had been called in to repair their TV set, and thinking to kill two birds with one stone I stopped at Hank's store first. As it was near his closing time, I told him to bring my order across the street to me when it was ready.

At the beauty parlor I found a TV picture that was stretched out too far vertically (giving the performers pointed heads and sawed-off legs) with a fold-over at the bottom. Looking at it gave me the willies.

The symptoms were familiar, but in this case I traced them to a new cause. There is a sawtooth voltage in the vertical output as well as in the horizontal. It is 60 cycles a second instead of the horizontal's 15,750.

If this sawtooth voltage becomes distorted, it can cause a foldover—but up-and-down rather than sideways. Usually the trouble is caused by a defect in the vertical circuitry. But not this one. Here, due to a new circuit arrangement, a de-

fect in the horizontal output was to blame.

In this new setup the control-grid bias for the vertical output is supposed to be minus-six volts, drawn through a resistance leg from the minus-30 volts that is on the horizontal-output tube's control grid.

Now, if the horizontal-output tube becomes weak or gassy, this minus-30 drops, lowering the vertical's minus-six in proportion. This makes the vertical-output tube run hotter and hotter, distorting the sawtooth, and causing a vertical foldover. This set's horizontal-output tube had become gassy. A new tube fixed the vertical sweep. I turned on the set and all the stubby-legged performers sporting pointed heads had disappeared.

As I was making out my bill the proprietor of the beauty shop came over. "I'm a barber, too," he said. "How about taking the bill out in haircuts?"

Since I needed a trim, I sat down in a chair alongside a row of women with hair dryers over their heads. No sooner had the scissors started snipping than Hank walked in with my order. That was when he gave his first wolf whistle. END

6 Tips for Small-Boat Skippers

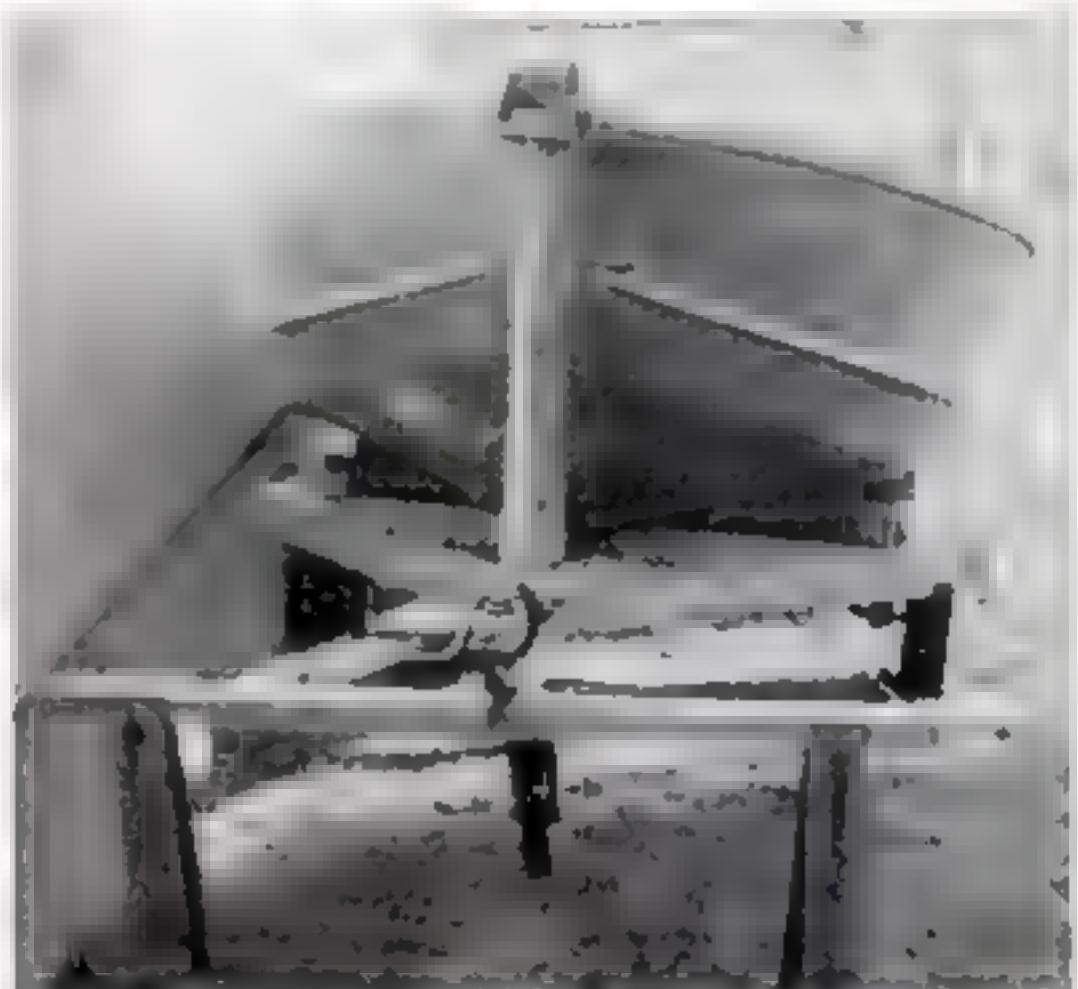
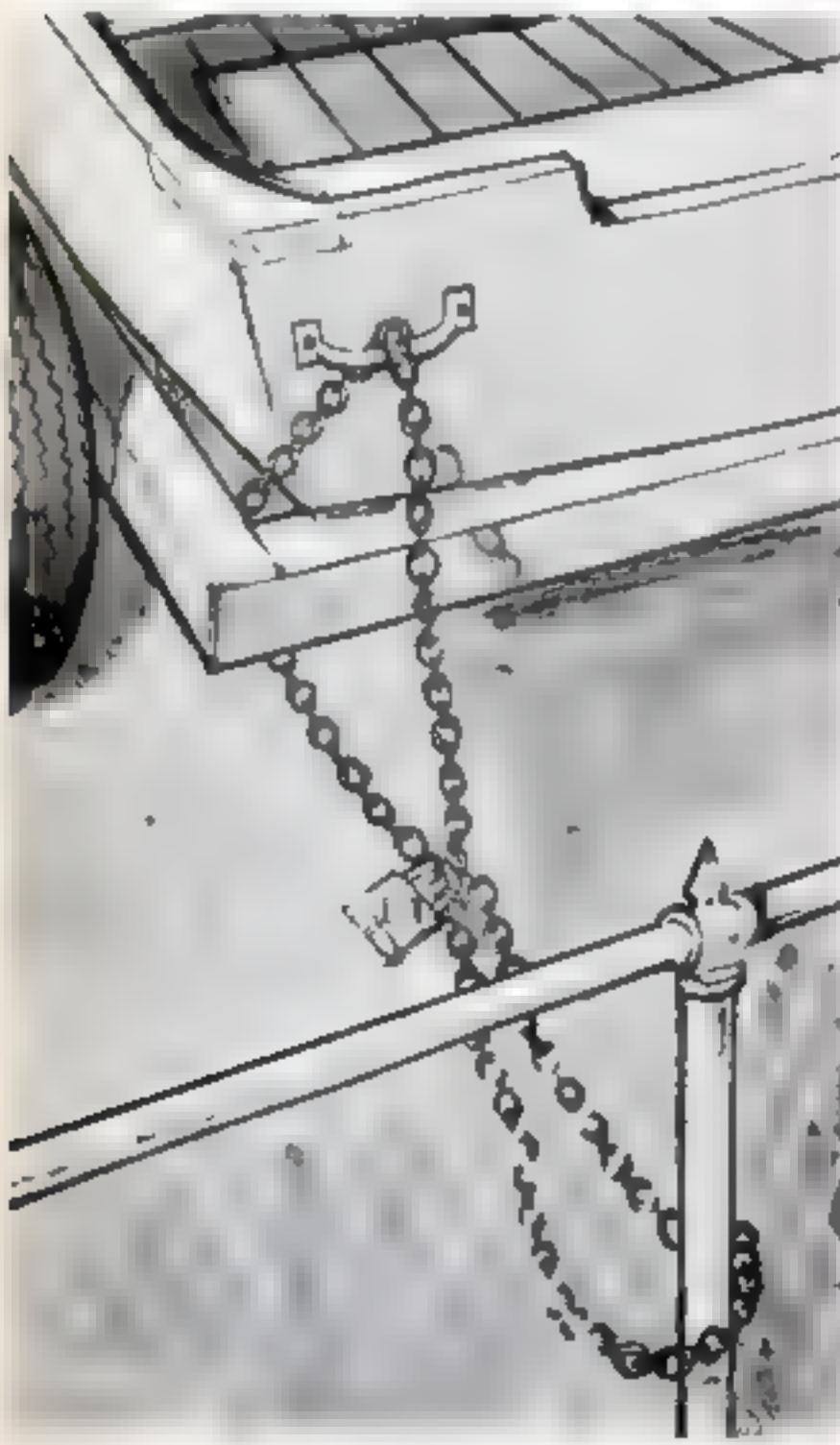


1 **Boarding a boat** from the water is easy on a ladder made from a tire chain. The end connecting links can be bent into hooks to fit over the gunwale. If desired, garden hose can be fitted on the cross links to protect a swimmer's feet.



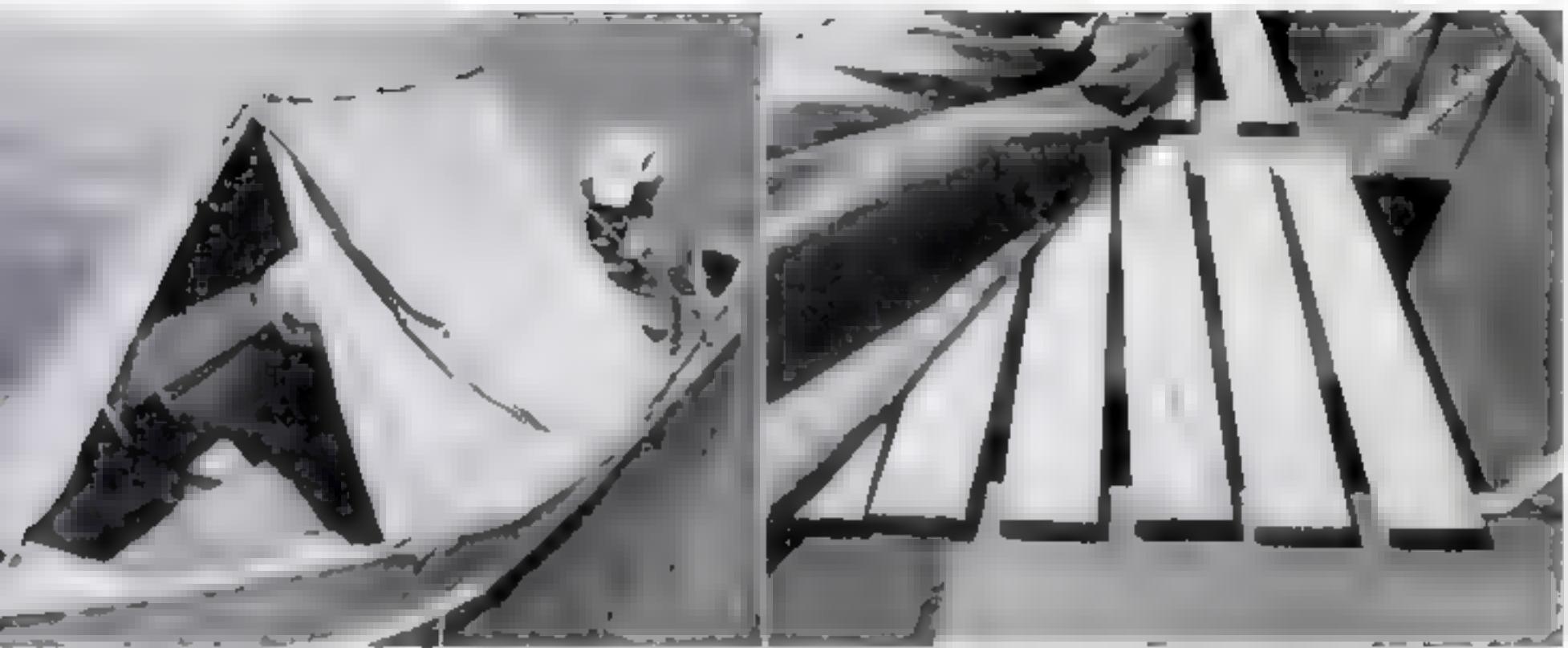


2 A pup tent makes a cabin cruiser out of the 15-foot runabout shown here. Erected over the forward half of the boat, it provides shelter for two sleeping bags spread out on slats that span the seats.



3 Drain rainwater from your boat as quickly as it falls, by propping up the front of the trailer on a sawhorse. Remove the drain plug to let water run out.

4 Use the safety chain on your trailer to protect it when you park. Run the chain through the trailer frame and around a tree or post, then padlock it.



With the tent partly folded back, one person can relax inside, while another fishes from the open stern section. Air mattresses under the sleeping bags and life-preserver cushions make comfortable bedding. Instead of using the tent's center poles, two sets of "rafters" were used to support it. They were made by hinging

paired lengths of furring strips together and notching their ends to fit on the gunwales. Guy lines to the bow and stern keep the tent upright, and suction cups stuck on the outside of the hull provide tiedowns for the tent sides. The slats spanning the seats to make the berth support were cut from one-by-four pine.



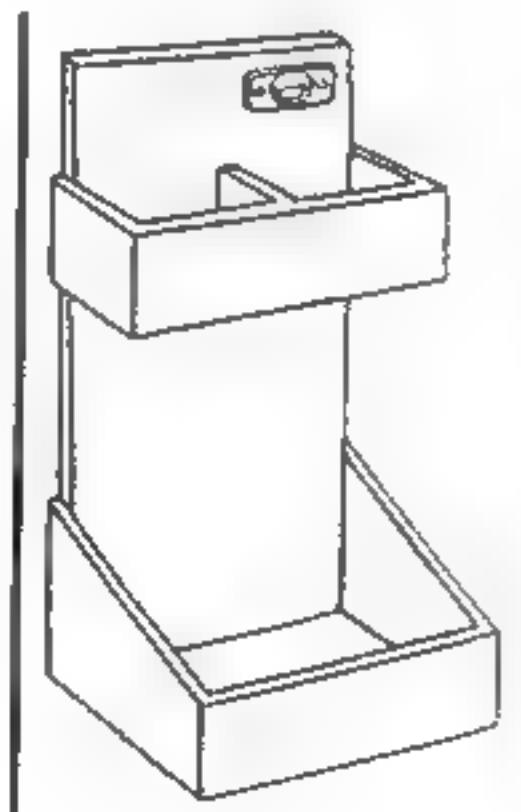
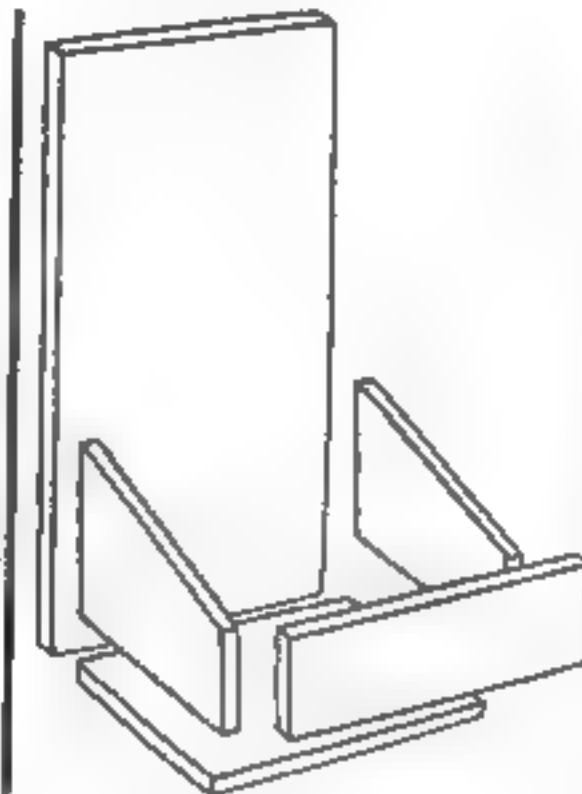
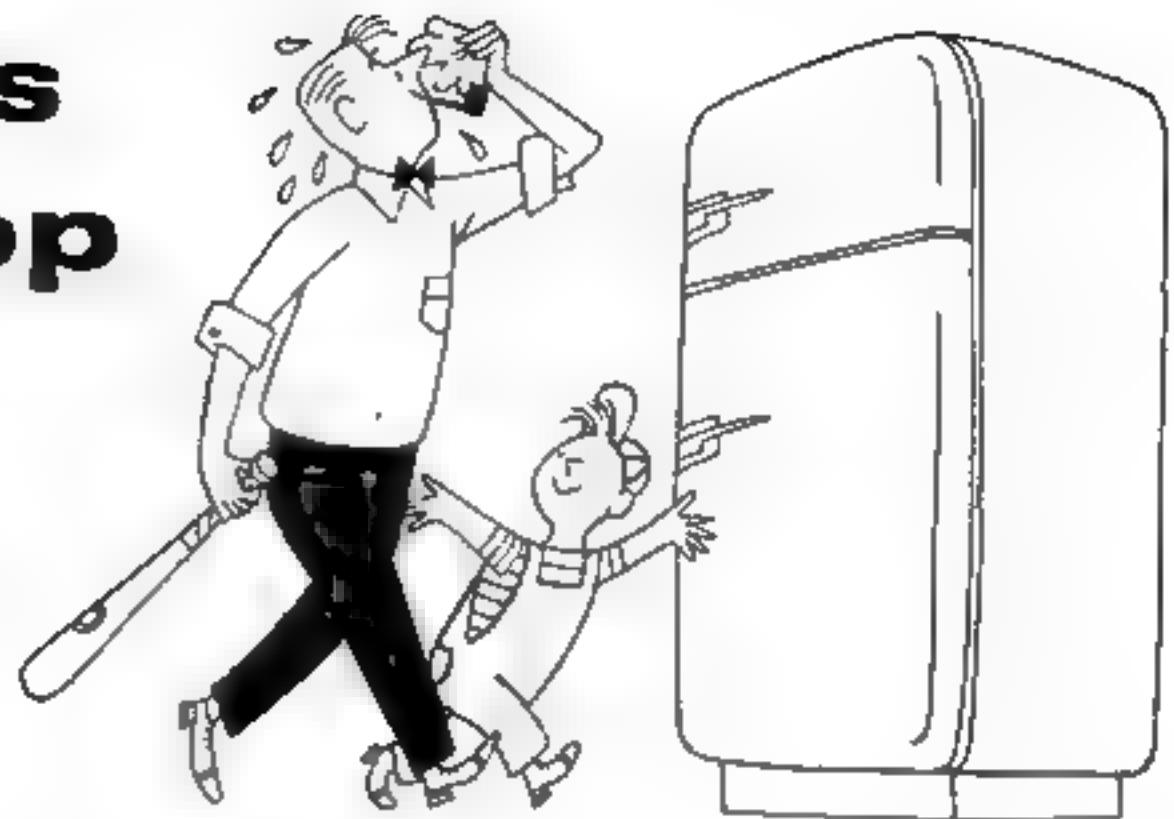
5 Tired of tripping over fishing gear on the bottom of your boat? Make rod holders that stick to the inside of the hull. Buy suction-cup coat hangers (auto-supply stores usually have them), remove the hangers and bolt metal strips to the screws molded into the rubber cups. Then bend the strips into hooks to support the rods. Moistened slightly, the cups stick without marring the finish of the boat.



6 When clamping a thimble in the end of a trailer's winch line to form an eye, be sure to place the U section of each clip over the "laying" end—the short, free end—of the wire rope. This protects the "standing" part of the wire, which takes the strain when weight is applied. If clips are placed in either of the two wrong ways illustrated, there is danger of crushing and weakening the winch line.

Wordless Workshop

By Ray Doty
and Ruth Westphal





Next Month: A back-yard telephone shelf to save dashing Indoors

JULY 1958 181



New Hook-Jaw Hex Wrench Hangs On Tight

YOU'LL soon see a brand-new kind of tool in hardware stores—an adjustable wrench designed especially to grapple with the problem of hex-shaped nuts on fancy fixtures like faucets or in hard-to-reach places. It won't chew up a fine chrome-plated finish. It won't bruise your knuckles by suddenly slipping off. You can use it for years on the same soft-metal fittings without rounding off the corners.

The new wrench, just announced this month, will handle all types of fittings, but its real meat is the hex. Its hook-shaped jaw literally wraps itself around the nut. Its grip is tenacious, yet gentle. As you pull on the wrench, the jaws

tighten on the nut, instead of remaining fixed. This keeps the jaws from rocking on the corners of the nut and wearing them down.

Because of the self-tightening action, you can set the wrench to slip on and off the nut easily without fear of a slippery fit. Any slight looseness is taken up by the squeezing action of the jaws. The jaw is not spring-mounted, so that, if necessary, you can rotate the wrench backward without its opening.

Three sizes of the new wrench will be sold by the Ridge Tool Co., Elyria, Ohio, for about \$3 to \$9. The smallest size will take nuts from $\frac{5}{8}$ " to $\frac{3}{4}$ "; the largest, 1" to 2" nuts.

EVEN TRICKY JOBS ARE EASY—like tightening the chrome-plated faucet bonnet below, at left—because nuts are locked tightly in wrench's "crook." Jaws are so smooth and snug that no

pads are needed to avoid scratches. Photos at center and right show how different-size nuts automatically center themselves so the wrench can be slipped on and off quickly.





Masking Tape Guards Against Saw Scratches

WHEN you have to graze the surface of one piece while sawing another at right angles to it, you can keep from scratching the grazed member by protecting it with two layers of masking tape.
—*Edwin M. Love, Palmdale, Cal.*

Utility Palette Is Made from Blown Fuses

DISCARDED glass household fuses can be converted easily into a neat holder for water colors, glue, flux or solvents.

You simply bend up the small strip soldered at the top of the brass base and unscrew the base. Everything drops out, leaving a clean little glass container.

Several can be set in blind holes drilled in a strip of one-by-two stock and fastened under the edge of the workbench or a drawing board. If you install it with a single pivot screw, you can swing it out of the way under the surface when it is not being used.
—*Bil Toman, Palatine, Ill.*

Short Cuts and Tips

FROM PS READERS

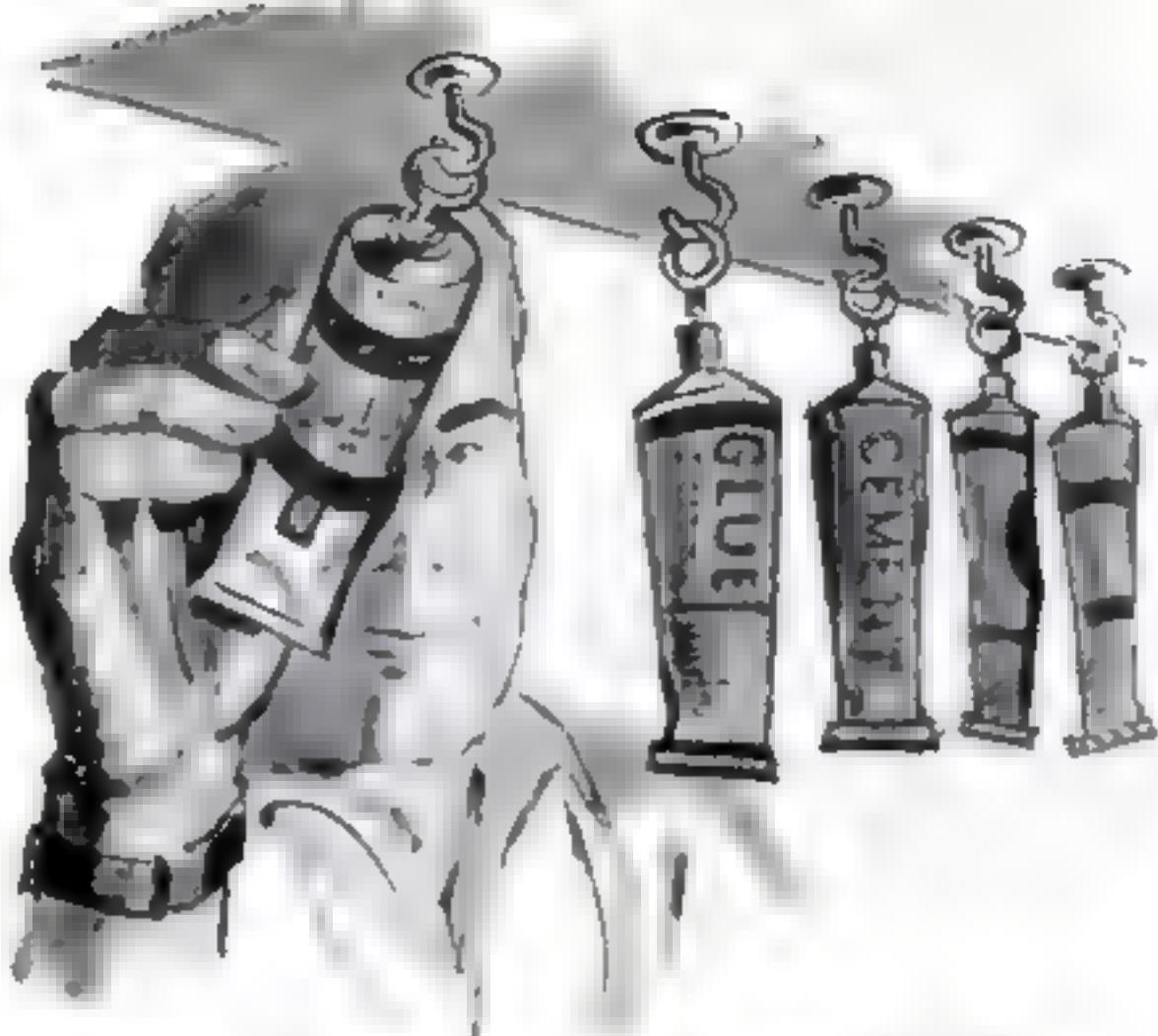


Short Cuts and Tips

Hang-Up Tops for Small Tubes

You can seal tubes of cement, glue or wood putty by screwing a cup hook or screw eye into the opening.

This not only seals the tube as effectively as the old stopper but makes it possible to hang it from a wire or another cup hook.—*Bill Caine, Red Bluff, Cal.*



Continuous Temperature Gauge

With this rig you can keep a constant check on water temperature while processing photo film.

First attach a short length of hose to the faucet, and then make a small hole in one side of it to hold a thermometer of the rod type.—*James Edwards, NYC.*



Modelmaker's Needle Drill



While building a ship model I had to make some tiny holes, but lacked small enough drills. So I cut a 1" length of $\frac{1}{4}$ "-diameter dowel and shoved a large sewing needle about $\frac{1}{2}$ " into the center of one end. Then I broke off half of the needle's eye, making it a two-prong drill.

Rotating the dowel drill holder by hand with a very light touch produces good results.—*Edmund K. Walters, Chicago.*

Home-and-Shop Index Is Yours for the Asking

DO YOU keep a file of back issues of POPULAR SCIENCE? Would you like to make sure that you'll always be able to put your finger on home, shop and handicraft articles of special interest?

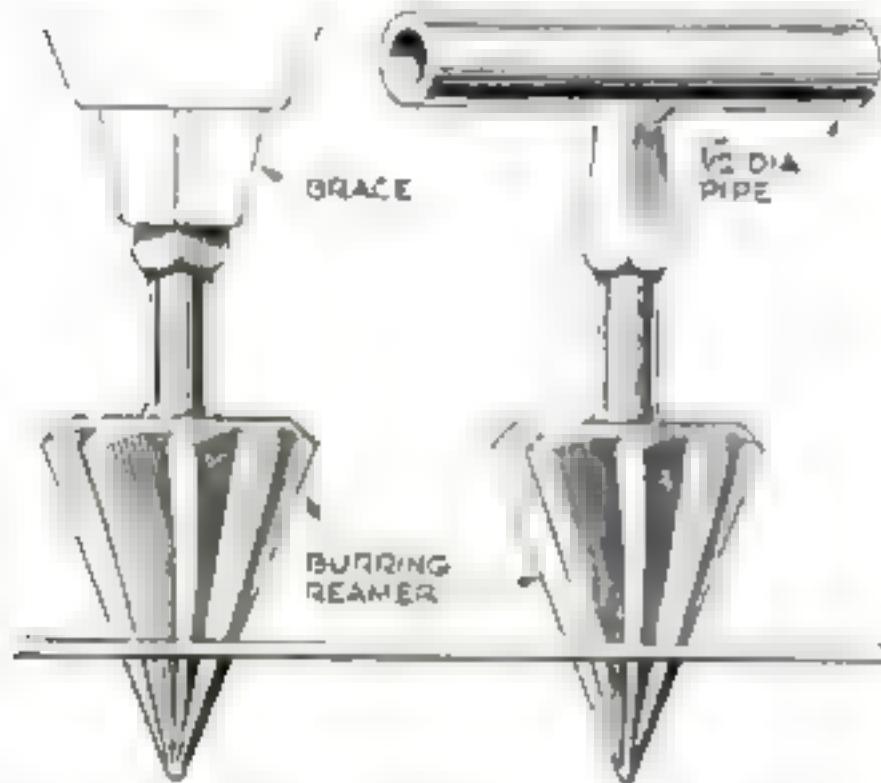
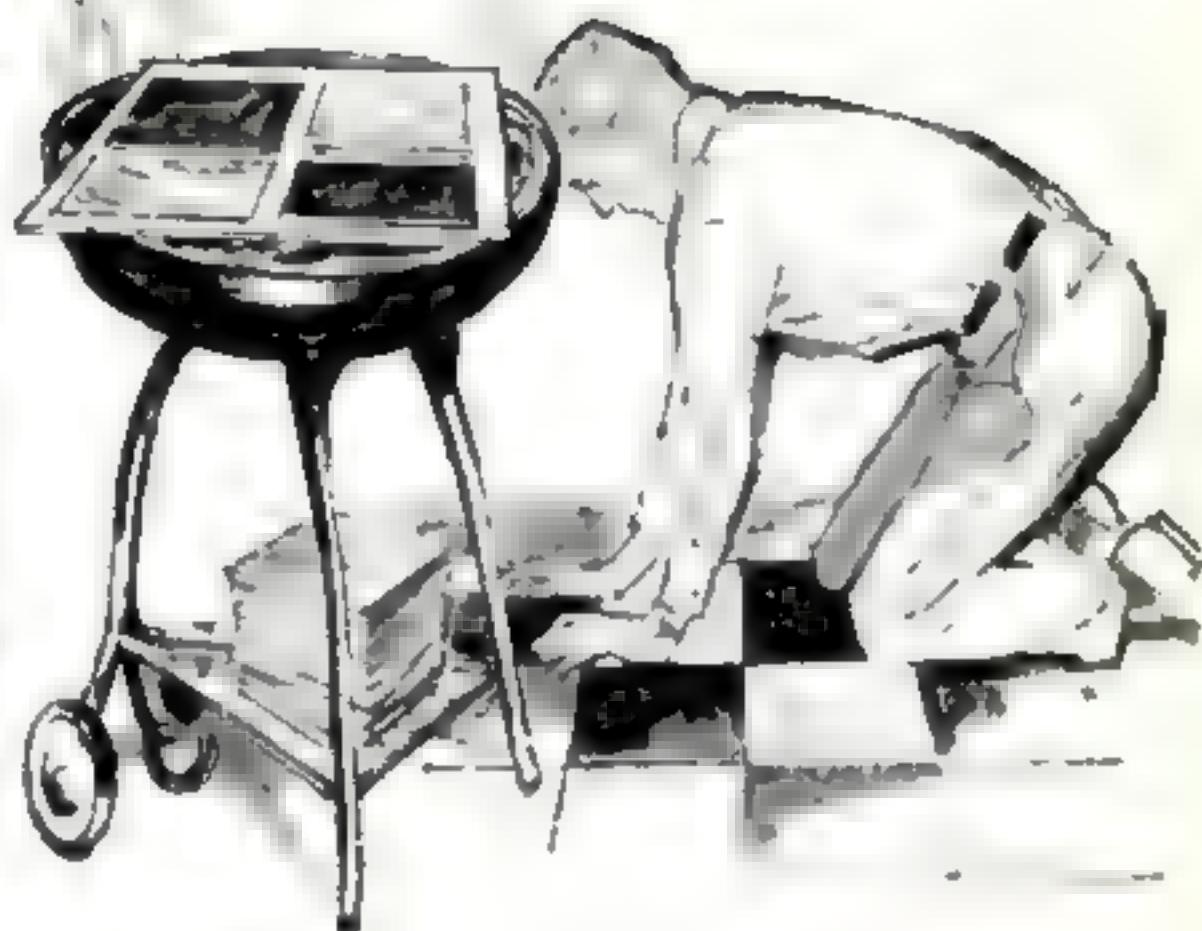
An index to help you is now ready. It covers the issues from July, 1957, through June, 1958, and is free to readers who request it, as long as the supply holds out. Just send your name and address on a card or in a letter, saying you want it. This index, and one for July, 1956, through June, 1957, are the only ones available. Address your request to: Index Editor, POPULAR SCIENCE, 353 Fourth Ave., New York 10, N. Y.

Short Cuts and Tips

Heating Asphalt Tile with a Grill

NEXT time you have asphalt tile to lay, get out your charcoal broiler and keep it handy. With a small fire going and a heavy-gauge metal sheet over the grill, you can quickly heat tiles to be bent or cut.

The tile will be heated evenly and you can do several at a time if you like.—*C. Cerkiski, Norridge, Ill.*



Reamer for Sheet Metal

A PLUMBER's burring reamer does a fast job of enlarging holes in sheet metal. I've used one to install a cigarette lighter and a heater switch in the dashboard of a car and a truck.

The reamer is made to be chucked in a brace and bit, but for strictly hand use you can braze a short length of 1/2"-diameter pipe on the top of the shank as a handle.—*Mike Parsons, Salt Lake City.*

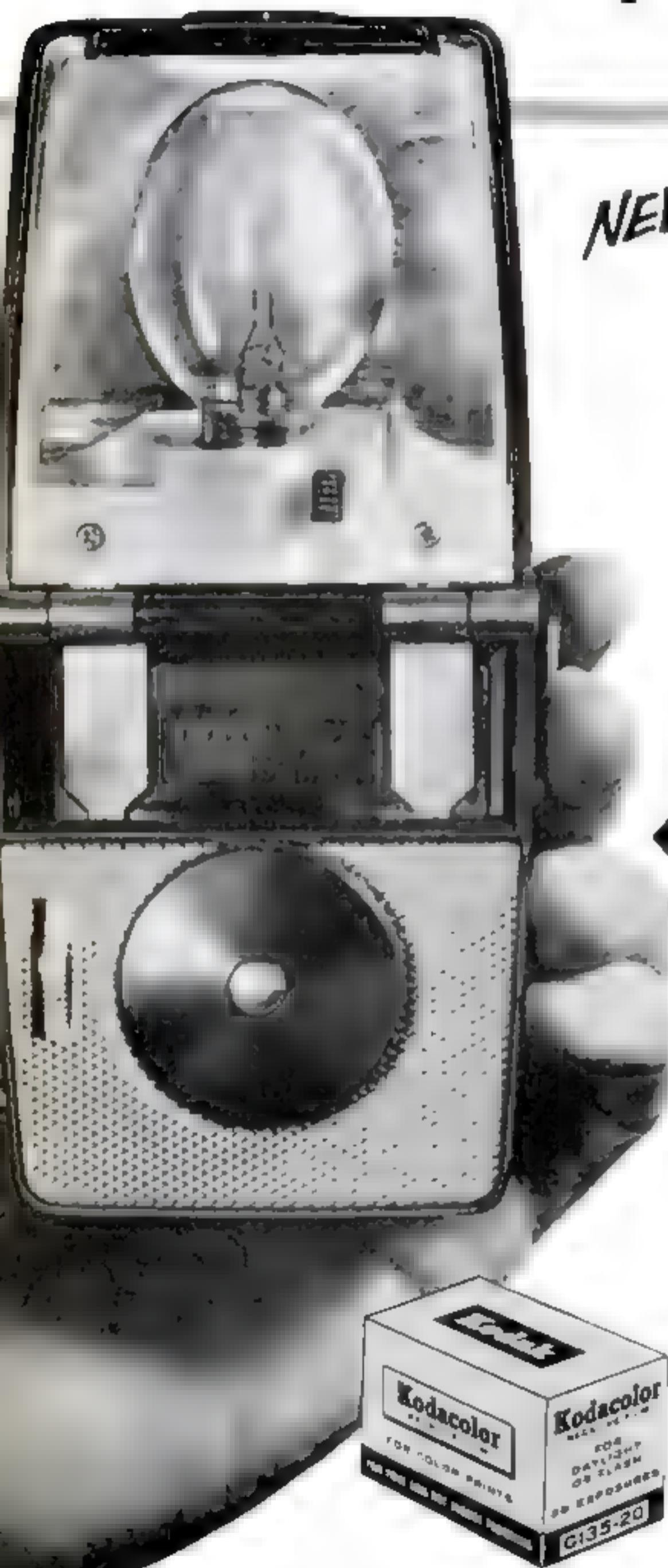
►►►THE paints and enamels that come in pressurized cans spray best if their temperature is above 70 degrees. On cool days, dip the container in a pan of luke-warm water. But keep it away from open flame.—*Ken Todd, Peru, Ill.*



Pipe Nipple Is Tool Holder

CAP both ends of a suitable pipe nipple and you will have a strong case to keep stiff wire probes, small files and the like separate from other tools in the box or bench.—*Farley Jones, Jersey City, N. J.*

FROM KODAK—photo aids to



NEW!

Kodak Generator Flashholder makes its own power for flash shots!

Exciting new flash idea—makes its own power! Just twirl the knob—and fire! Folds to palm-size, fits your pocket. Takes all M-2, No. 5, and M-25 flash bulbs. Simplified exposure calculator covers both EVS and *f* values. Two models to fit most cameras. Kodak Generator Flashholder ... \$13.95 and \$14.95 or \$1.50 down. (Also available in a battery model, \$7.95.)

◀ ACTUAL SIZE—open for use.

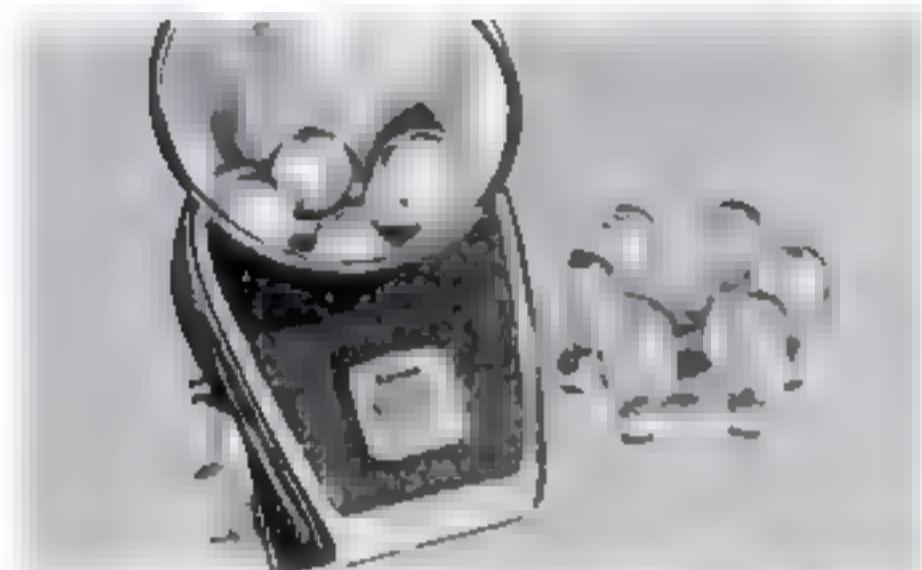
NEW!

A 35mm film made especially for color prints —Kodacolor 135!

New Kodacolor 135 for 35mm cameras. Gives you color *negatives* for *color prints and enlargements*.

Kodacolor 135 is a fast color film (Daylight Index 32) that can be used indoors or out—without conversion filters. Try new Kodacolor 135 Film this weekend. A 20-exposure roll is only \$1.85.

help you make better pictures!



Kodak Rotary Flashholder lets you take 6 flash shots without reloading! Simply revolve magazine turret for fresh bulb. Eject all spent bulbs simultaneously, reload in seconds. Has simplified exposure calculator. Complete with Midget B-C Flashpack, two carrier discs. Two models, from \$10.95.



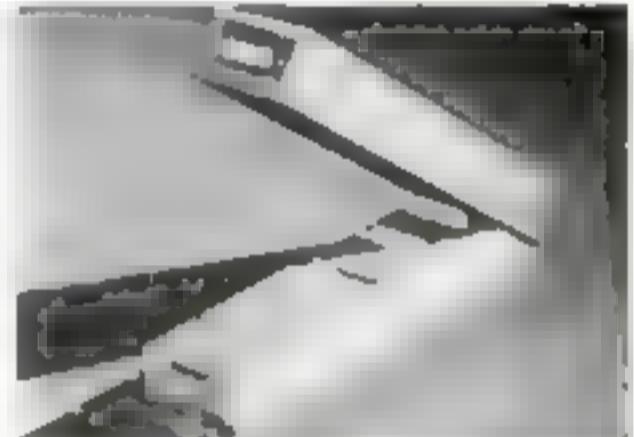
Kodak Filters for color pictures and better black-and-white shots. Daylight Filters (No. 85 and 85C) convert indoor Kodachrome Film to outdoor use. Skylight (No. 1A) reduces excess blue in hazy-day color shots. Kodak Pola-Screen Filter darkens sky without changing colors. Many others, from \$2.25.



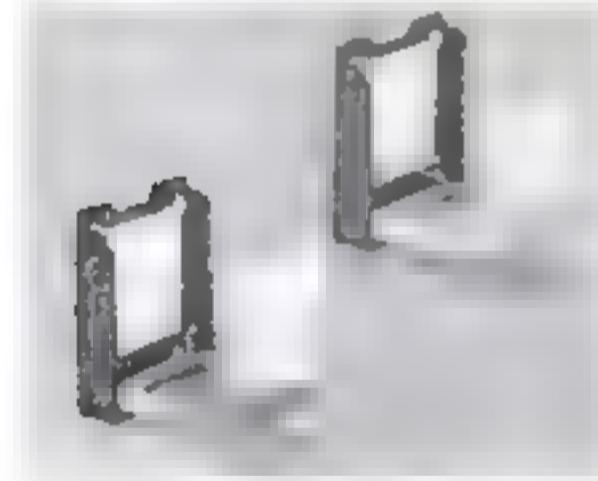
Kodak Lens Converters slip-on for wide-angle and telephoto movies with single-lens Brownie and Kodak Medallion Cameras. Each converter, \$18.50.



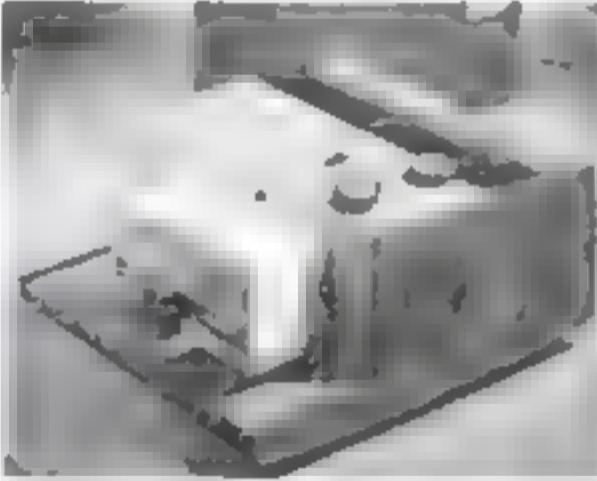
Kodak Field Cases give your camera the protection it deserves, are designed so camera is instantly usable. Smartly styled cases to fit most Kodak Cameras, from \$2.95.



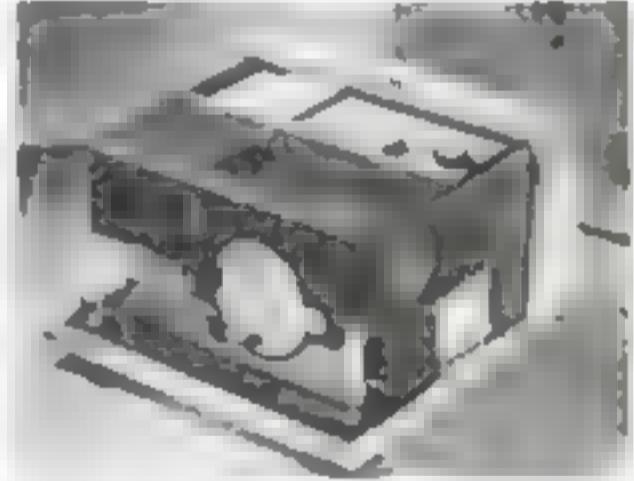
Kodak Slide Files keep your color transparencies safe and in order. Kodastide Ready-File, above, holds up to 200 cardboard 2 x 2 slides; \$2.25.



Kodak Pocket Viewers let you view color slides in existing light, give four-times magnification. Model 1, \$2.25; Model 2, permits viewing with both eyes, \$2.50.



Kodak 500 Projector shows your color slides big and bright, yet weighs only 9 pounds! With magazine changer, \$84.50; with Kodak Readymatic Changer, \$74.50.



Kodak Cavalette Projector is automatic—changes slides by itself! Keeps in constant focus, many other features. \$149.50 or \$14.95 down.

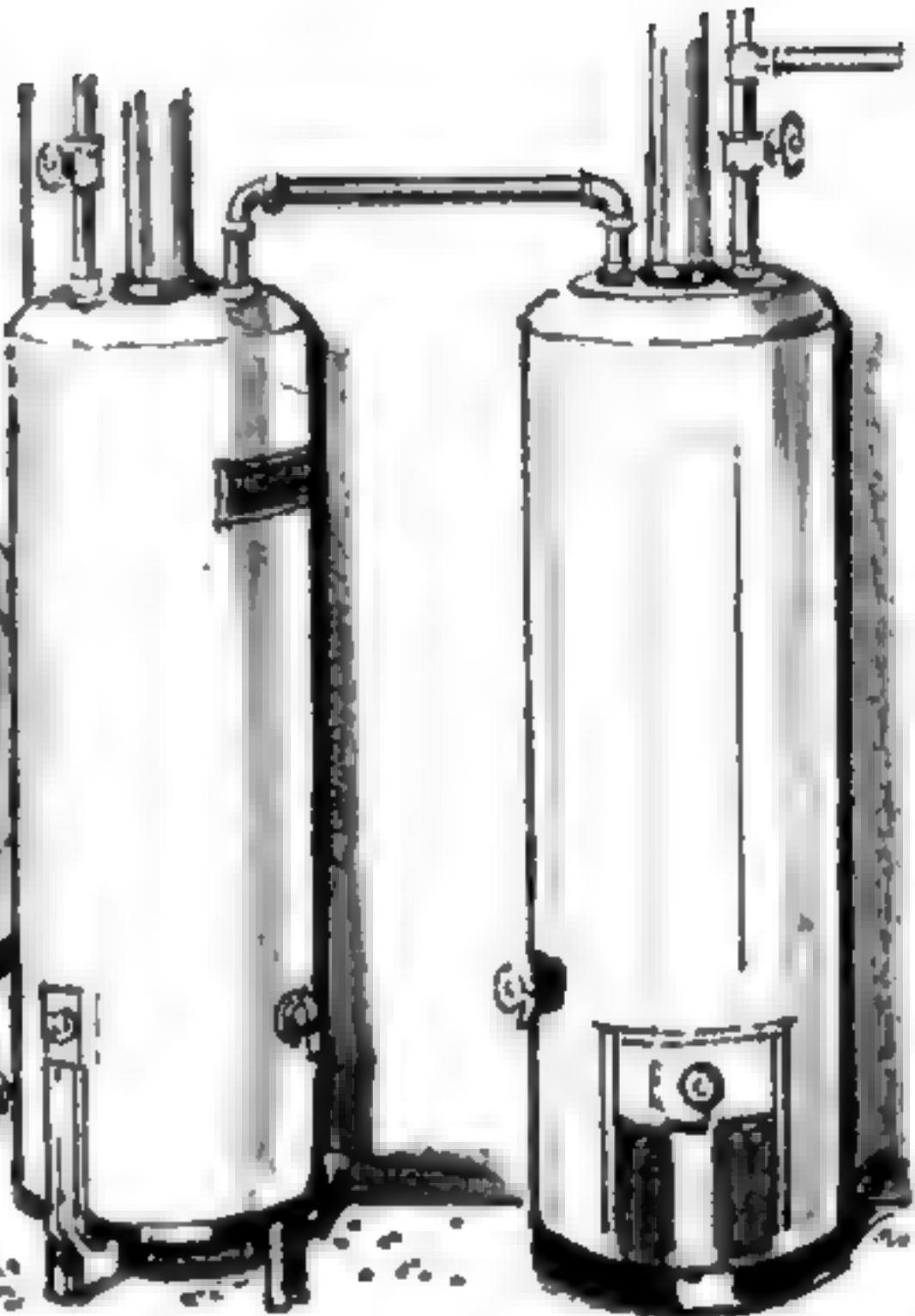
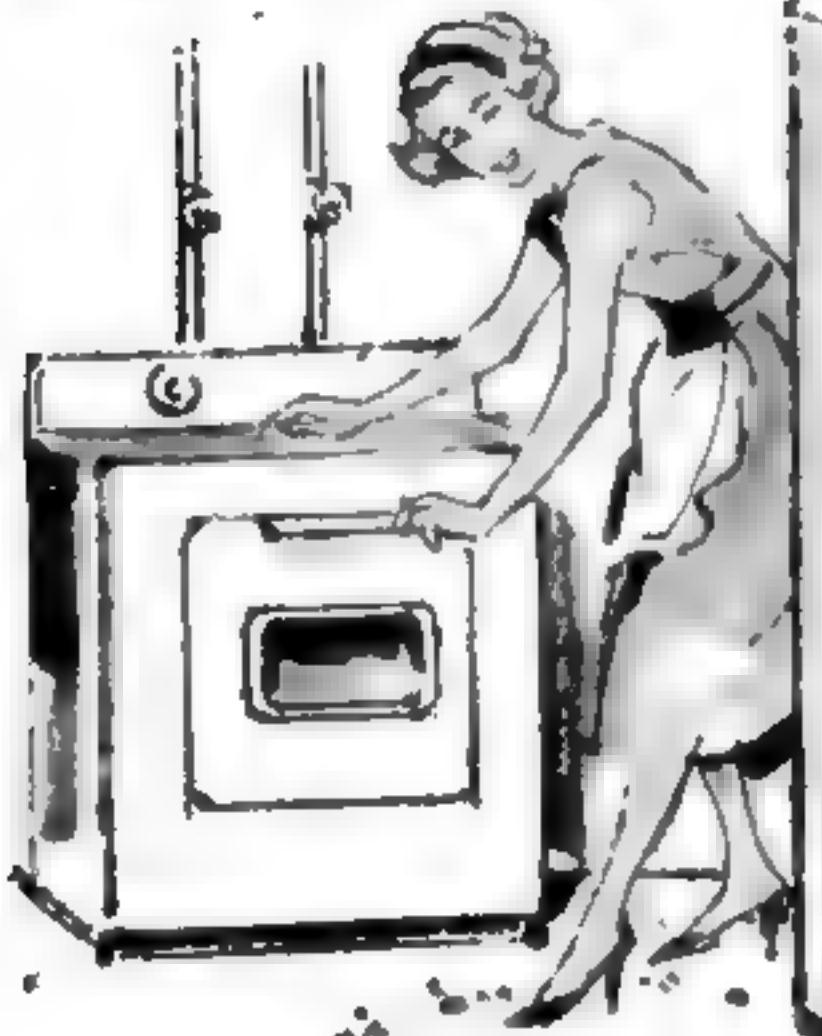
(Prices are list, include any Federal Tax, are subject to change without notice.)

See Kodak's "The Ed Sullivan Show" and "The Adventures of Ozzie and Harriet"

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SALES MANAGER

Short Cuts and Tips

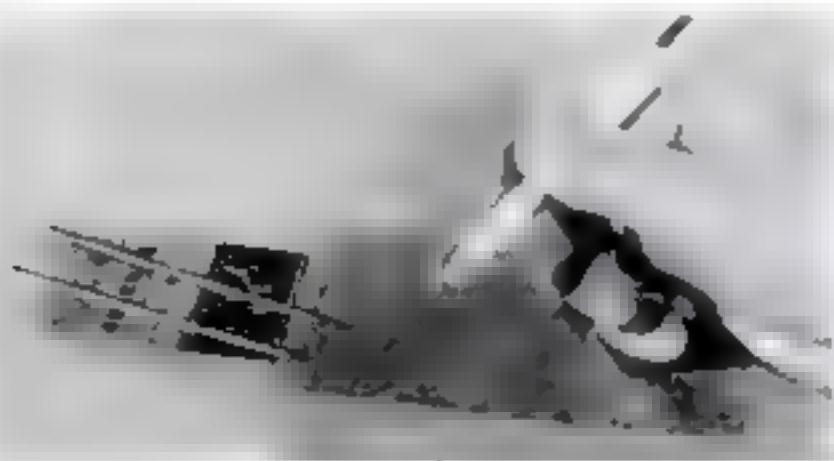


How I Use Two Water Heaters

WHEN I bought an automatic washer for my wife she was delighted—until our 30-gallon water heater took nearly two hours to recover after the first load. So I

installed a second 30-gallon heater ahead of the first, with its thermostat set at about 10 degrees lower.

Now we keep 60 gallons of hot water on tap.—*William Schroeder, Milwaukee.*



Ball Pen Made Into Scriber

A METAL scriber that you can carry in your pocket can be made with a phonograph needle and a ball-point pen. File off the point of an empty ink cartridge and enlarge the opening to accept a long-wearing needle. Retract the tip when it's not in use.—*Keith Morris, Cadillac, Mich.*



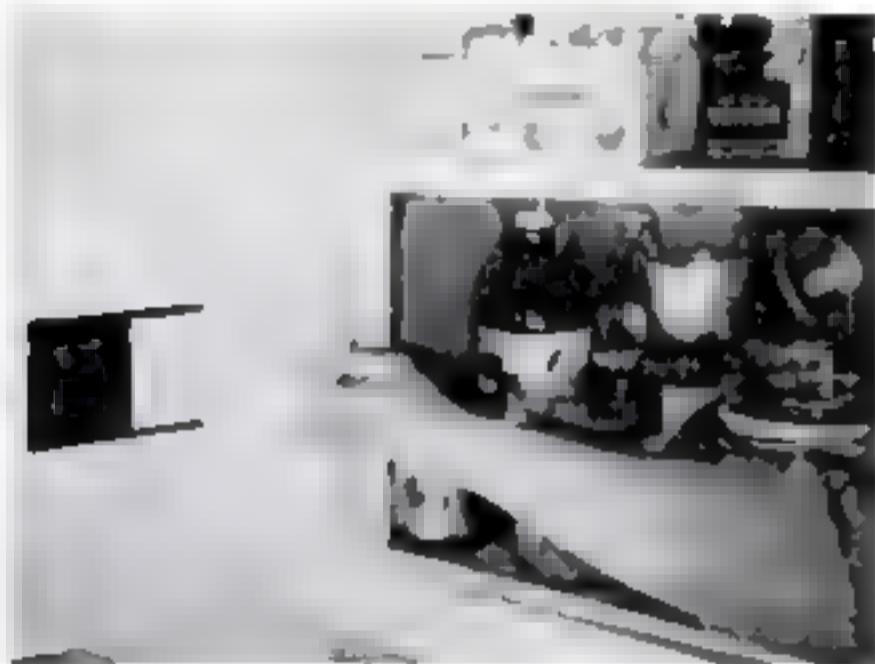
Small-Parts Cleaning Device

You can clean gunked-up bolts, nuts and small parts without wetting a hand.

Just drop them into a dime-store "soap saver" and swish the thing around in solvent. Even after an overnight soaking, it can be lifted and you won't have to fish for each part.—*Fred James, Nutley, N. J.*

Short Cuts and Tips

►►► BORROWED tools will find their way back to you faster if they are identified with a broad band of paint on the handles. Use the same color on all—a house mark.—*Blanche Campbell, Riviera, Cal.*



Cabinet-Door Recipe Holder

You can slide recipe cards in and out of this metal holder screwed to the inside of a cabinet door. I put mine on the door over the mixing counter.

Make the holder by bending guides on two opposite edges of a galvanized-metal or aluminum sheet a little larger than the cards used. Cards should slide easily.—*Arthur R. Tanner Jr., Poughkeepsie, N. Y.*

Extension-Cord Clamp Board

How often have you had a tool cord pull loose from an extension-cord socket when you were intent on a job? I made a clamping board to prevent this.

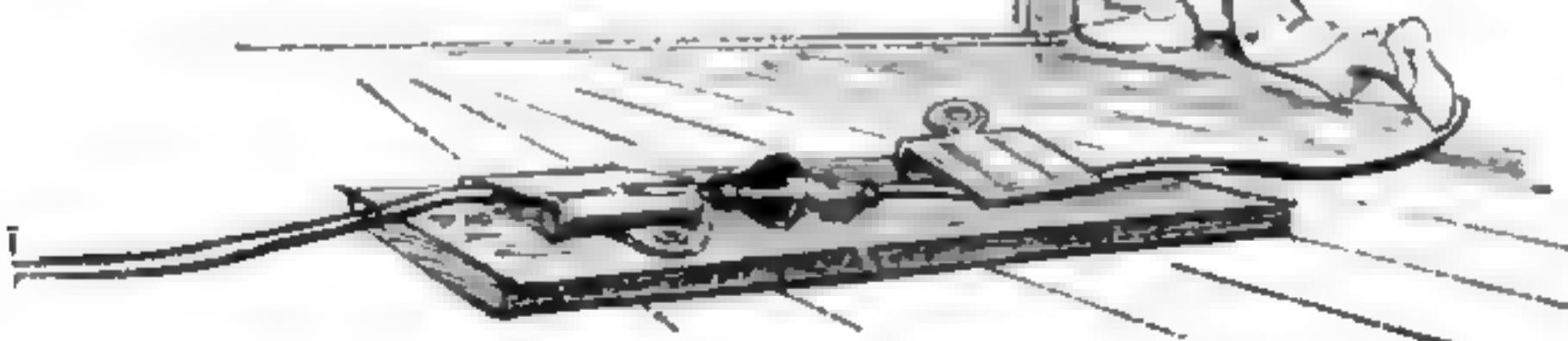
To 4"-by-8" scrap I screwed two heavy paper clamps. They hold both cords. The board, not the connection, takes the strain.—*John Mihalick, East Liverpool, Ohio.*



Stand for Hand Beater

MIXING batter, whipping cream, and similar kitchen chores are faster and less tiring if the beater has a firm support.

You can make a C-shaped stand like that above from $\frac{3}{4}$ " plywood. Attach the beater to the adjustable arm with screws driven through holes already in the appliance. The mixing bowl fits a shallow recess in the base.—*J. Bosma, Toronto.*



Short Cuts and Tips

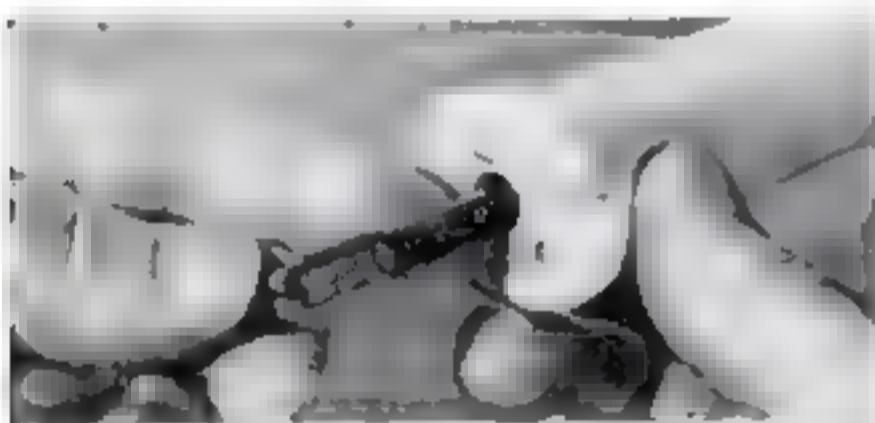
Hinged Pallets Fold Out of the Way

SMALL shops using pallets or other wooden platforms to store work on, often find the empty ones take up too much space. We solved this problem in our shop by cutting the pallets in half and hinging them.

The pallet rails were cut where the center boards meet and these boards were removed temporarily while the hinges were mortised in. A door bolt of the slide type was attached to each rail



to hold the pallets rigid when they are open.—*George Glavosik, Painesville, Ohio.*



Nail Set in Handle of Hammer

So you will always know where that elusive nail set is hiding, drill a storage hole for it in the hammer handle. Choose a hole diameter that will make the large end of the nail set an easy push fit in the handle.—*Kevin Murphy, Detroit.*



Mortar Box for Small Batches

You can mix small batches of mortar or concrete—for pointing and patching jobs—in a clean, inverted lid of a garbage can. Set the lid in an open nail keg or box so that the handle won't make it wobble—*Ralph J. Ahrens, Neshanic Station, N. J.*

Simple Decorative Candleholder



TURN a small flowerpot upside down, and you have an unusual patio candlestick. It can be painted for permanent use, or covered with foil or colored paper for parties.

Taper the candle end for a snug fit in the drain hole of the pot.—*Fred Cornelius, El Paso, Tex.*

Scaffold Nail Plugs Vent in Can

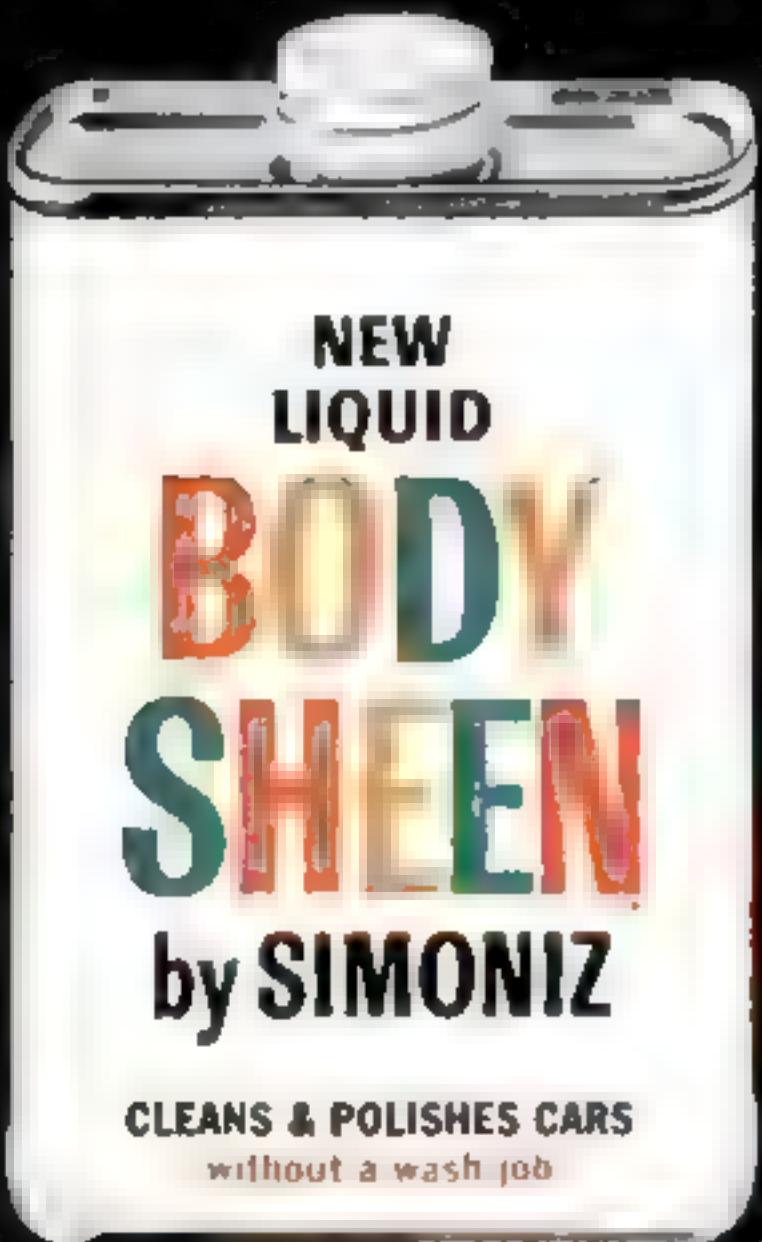
LARGE cans of oil or chemicals pour better with a vent hole in the top. To keep out dirt when the can is not being used, plug the vent with a scaffold nail, which has an easy-to-grasp head.

Punch the hole with the nail to get a snug fit.—*R. Mathiot, Lake Grove, Ore.*



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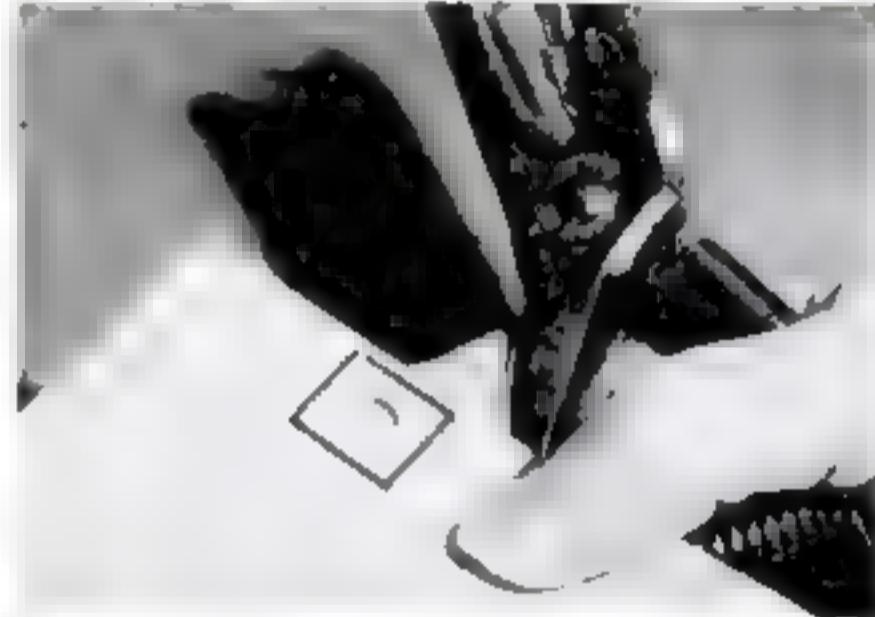
Transparent Work Top for Modelmaker

SUP those model plans under a sheet of glass laid over the top of your work table. The plans lie flat where they can be read easily and the glass makes a smooth work surface.—*J. Cullen, Springfield, Mass.*



Here's a Speedy Filter

A PIECE of cotton flannel tied over the end of a funnel makes a fast filter for photo solutions and other chemicals. Let the flannel bulge at the bottom for best results.—*Ken Murray, Colon, Mich.*

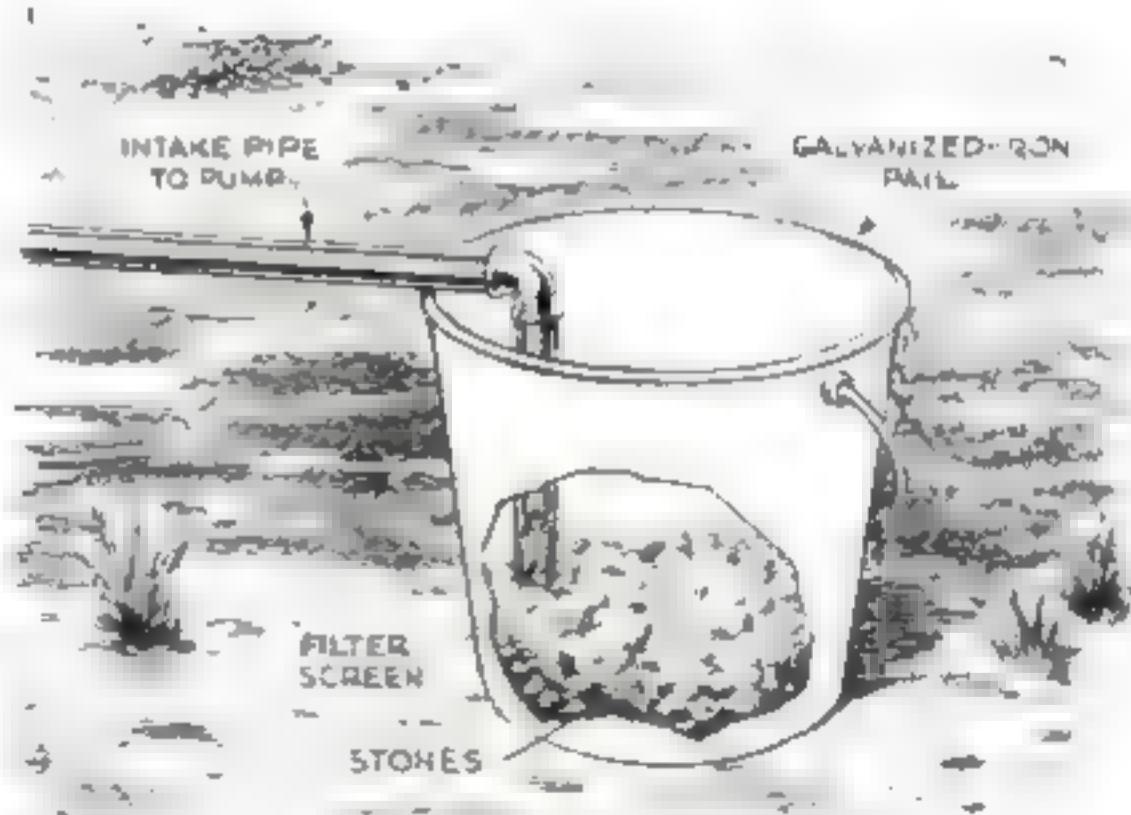


How to Reinforce Punch Holes

SMALL squares of adhesive-backed plastic, pressed into place and punched with the usual paper punch, make sturdy strengtheners for loose-leaf pages or clip-pings.—*Frank A. Javor, Newark, N. J.*

Water Intake for Lake Cottage

YOU can get clear lake water for a summer cottage by running the intake pipe to a simple protector. Weight a galvanized pail with small stones and set it on the lake bottom. Stick a fine-mesh filter screen into the end of the pipe and force the pipe between the stones. To pull the pail up for cleaning, hook its handle with a strong rake or boathook.—*L. A. Sovereign, Honey Harbor, Ont.*





38 SUPER AUTO

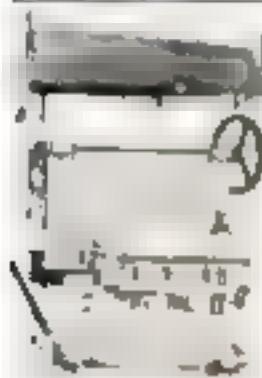
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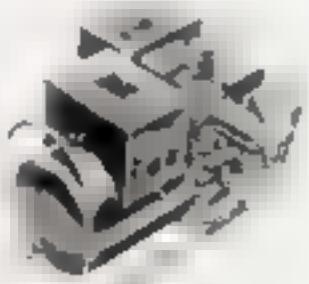
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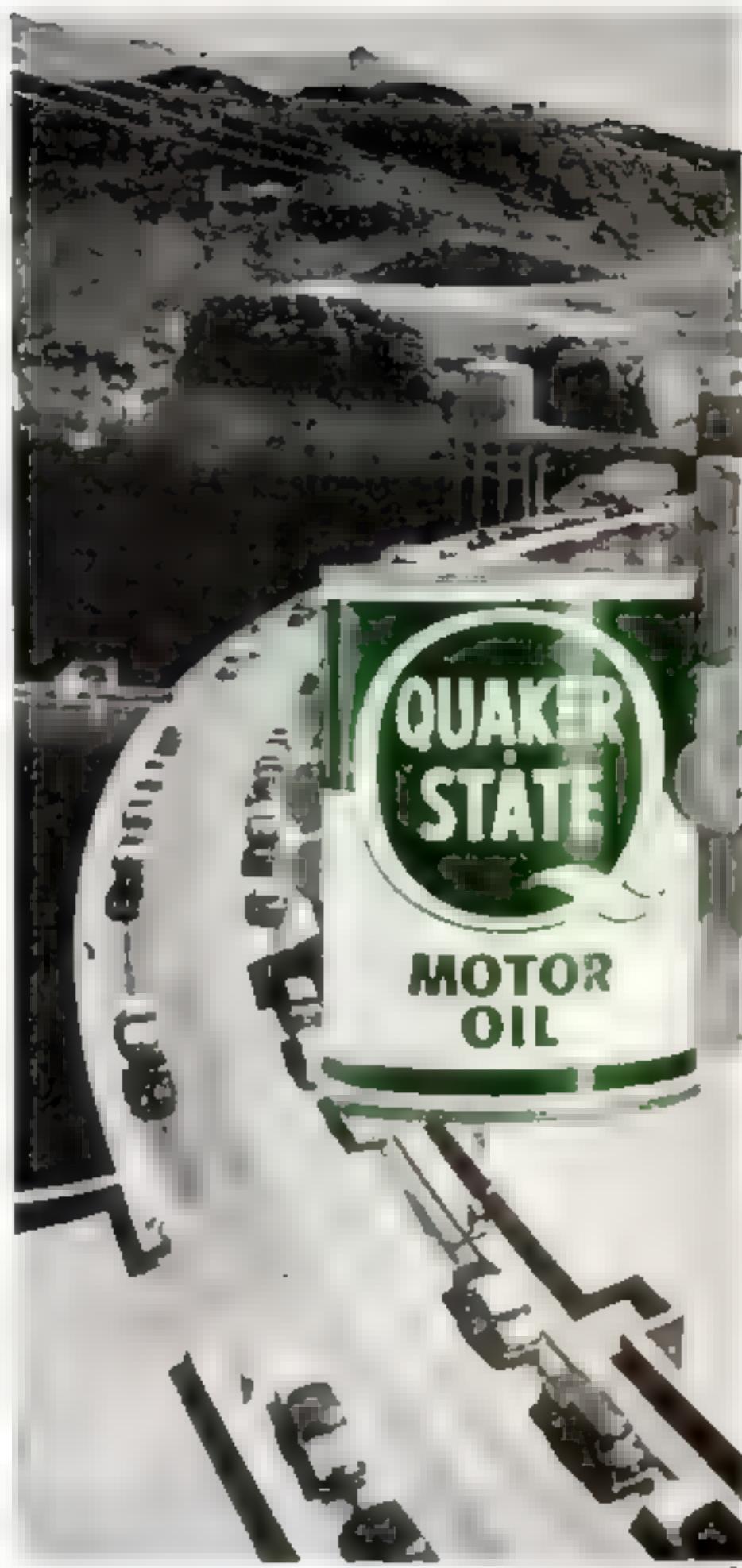
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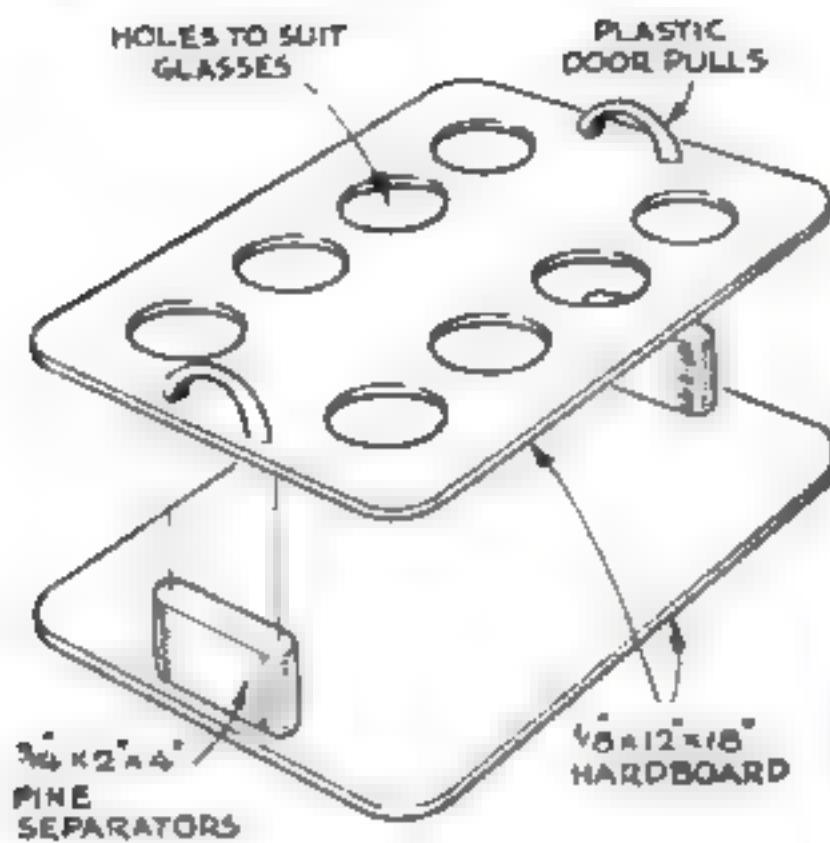
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Short Cuts and Tips



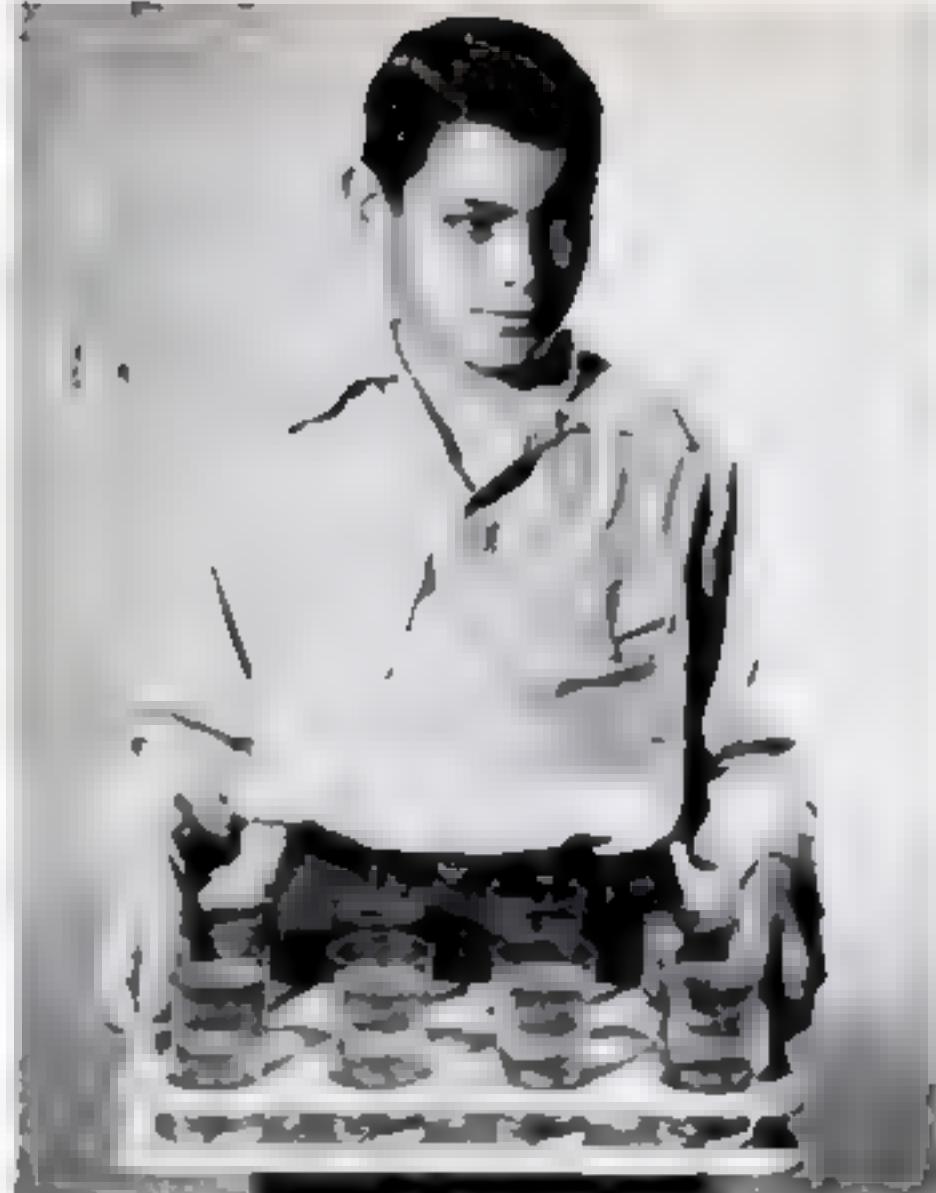
Door Pulls Make Tray Handles

THIS serving tray carries eight large beverage glasses without spills or skids. Two 12"-by-18" pieces of $\frac{1}{8}$ " hardboard are spaced 2" apart, one over the other. Just screw on two replacement door pulls, of the kind used on kitchen cabinets, for decorative tray handles.

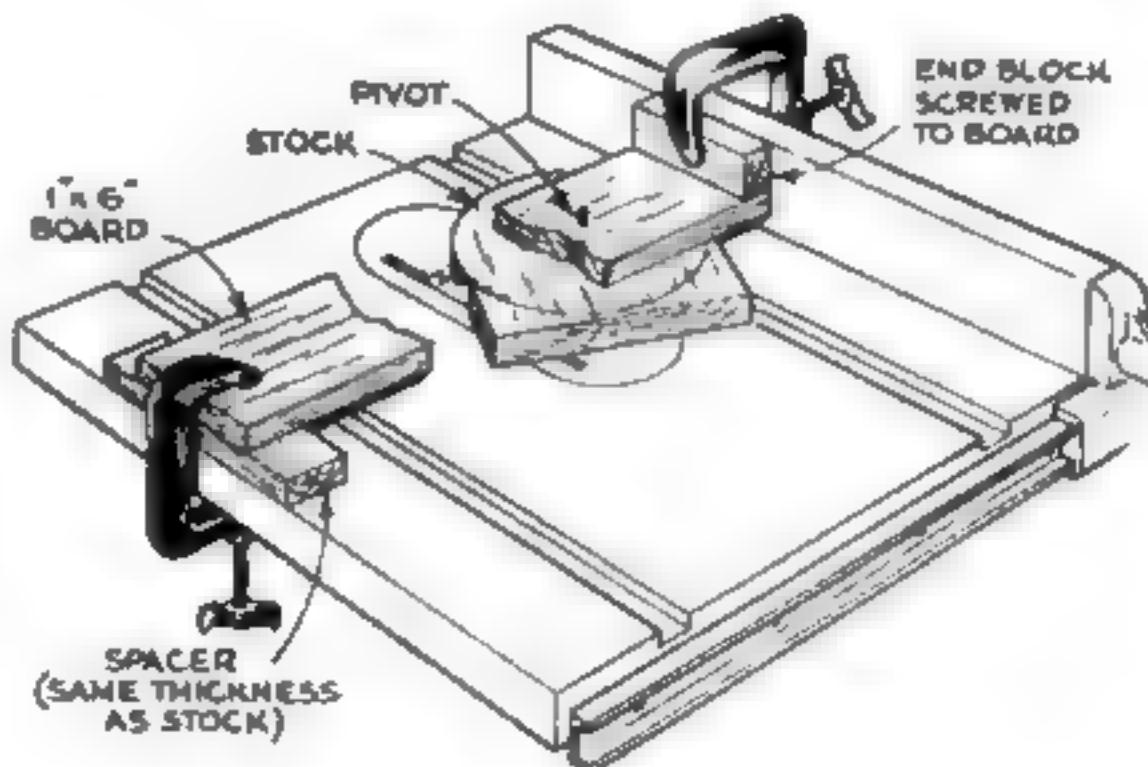
Cut Out Circles on Your Table Saw

THIS jig holds work beneath it on the table saw while you neatly cut disks out of square stock. Drill a hole for a $\frac{1}{2}$ " dowel or steel pivot pin through the jig board and the stock. Screw a wood block to one end of the jig and clamp it to the saw fence with the work in position and the saw blade fully retracted. Adjust the fence to locate the pivot the required distance (the circle's radius)

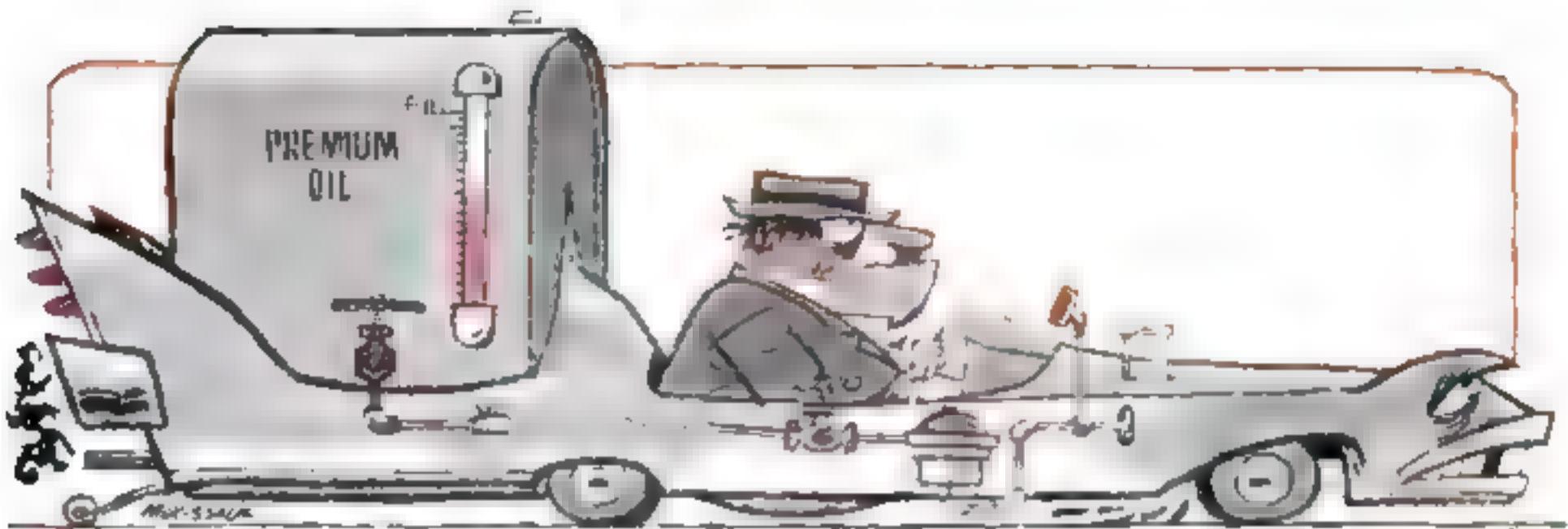
from the blade. Clamp the free end of the jig to the table, using a spacer beneath it to keep the stock from binding. Turn on the saw and raise the blade to cut into the wood about $\frac{1}{4}$ ", then rotate the work one



Scribe circles on the top panel, using an inverted glass as a guide. Cut out the holes with a scroll saw or electric hand-saw and smooth rough edges with a file and sandpaper. These Preswood panels and wood spacers had a primer and two high-gloss finish coats of paint before being fastened together. You can decorate the top by painting on a design.



full turn. Continue raising the spinning blade $\frac{1}{4}$ " at a time and rotating the work over it until the disk is cut through and the corners of the stock fall free of it.
—A. W. Stinton, Brush, Col.



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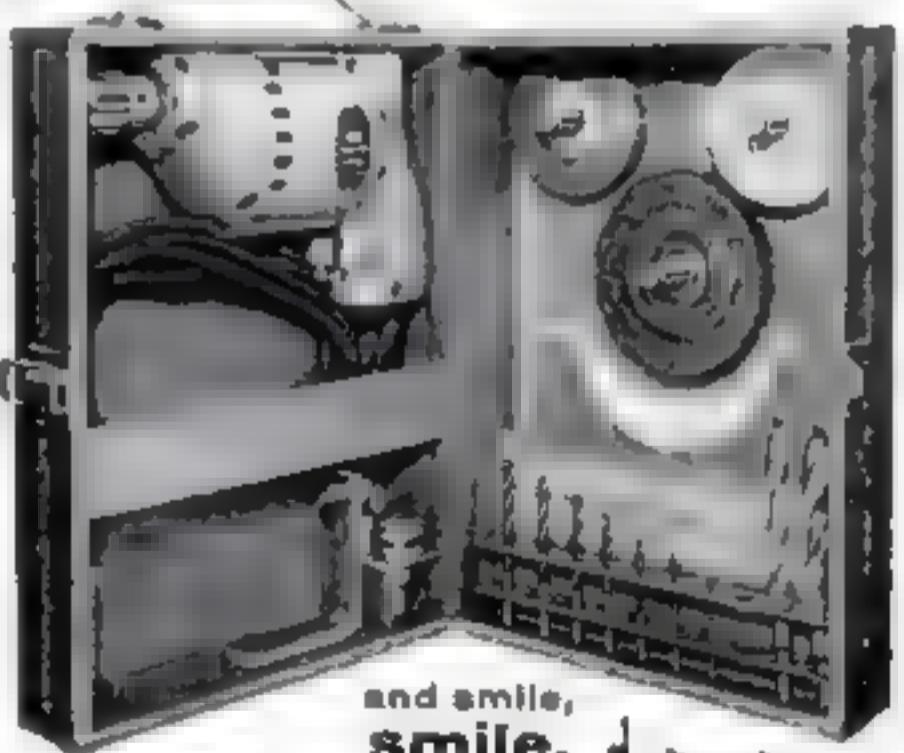
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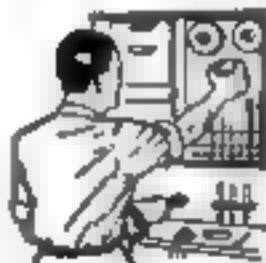
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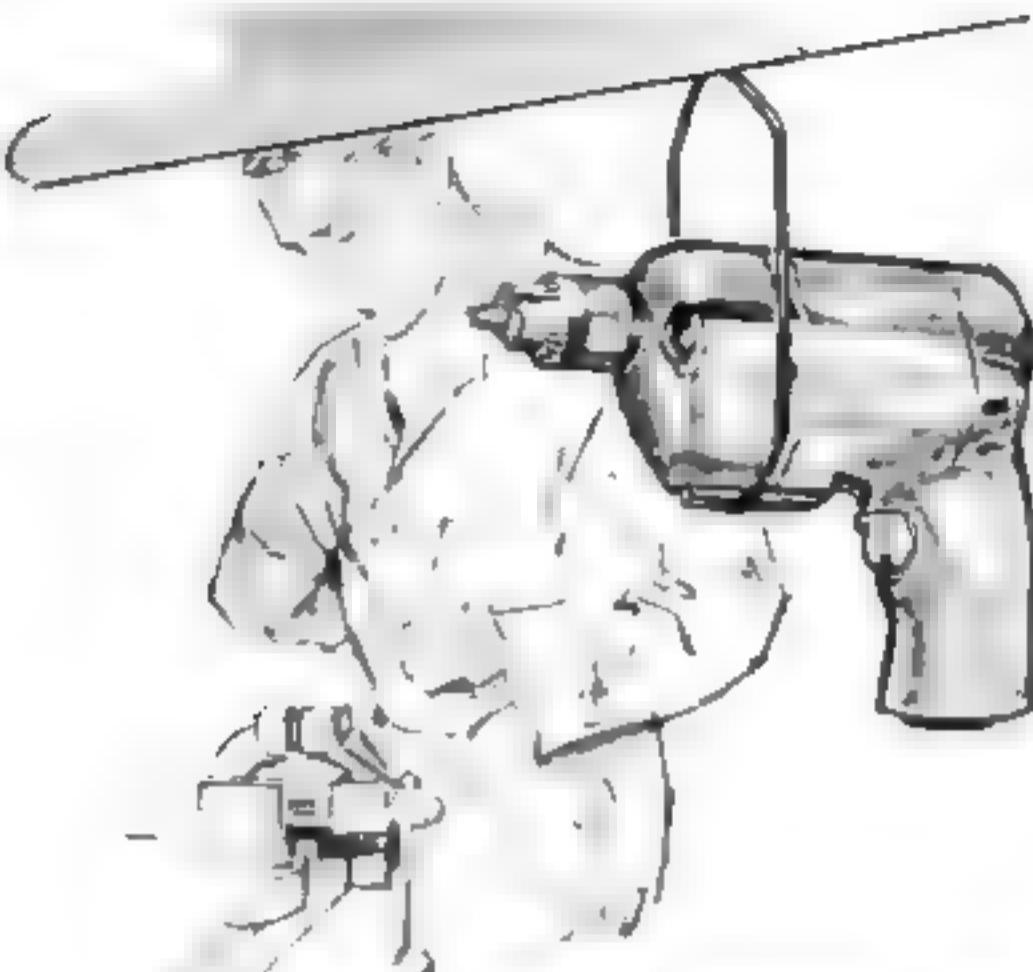
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Short Cuts and Tips

Drill Cradle from Coat-Hanger Wire

MY PORTABLE electric drill can be hung up with one hand in a cradle bent from a wire hanger.

The wire, rigidly stapled to an overhead joist, grips the drill at its vent slots to keep it from slipping.—*Harry Louden, Sarasota, Fla.*



►►►THE 12 compartments in a rigid, paper-fiber egg box will hold small parts from a motor or machine that is being torn down. Write the name and location of each of the stored parts on the lid so that when you close the box the identification will be right over the enclosed part. This will simplify reassembly and prevent loss.—*Lewis R. Walton, Arlington, Cal.*

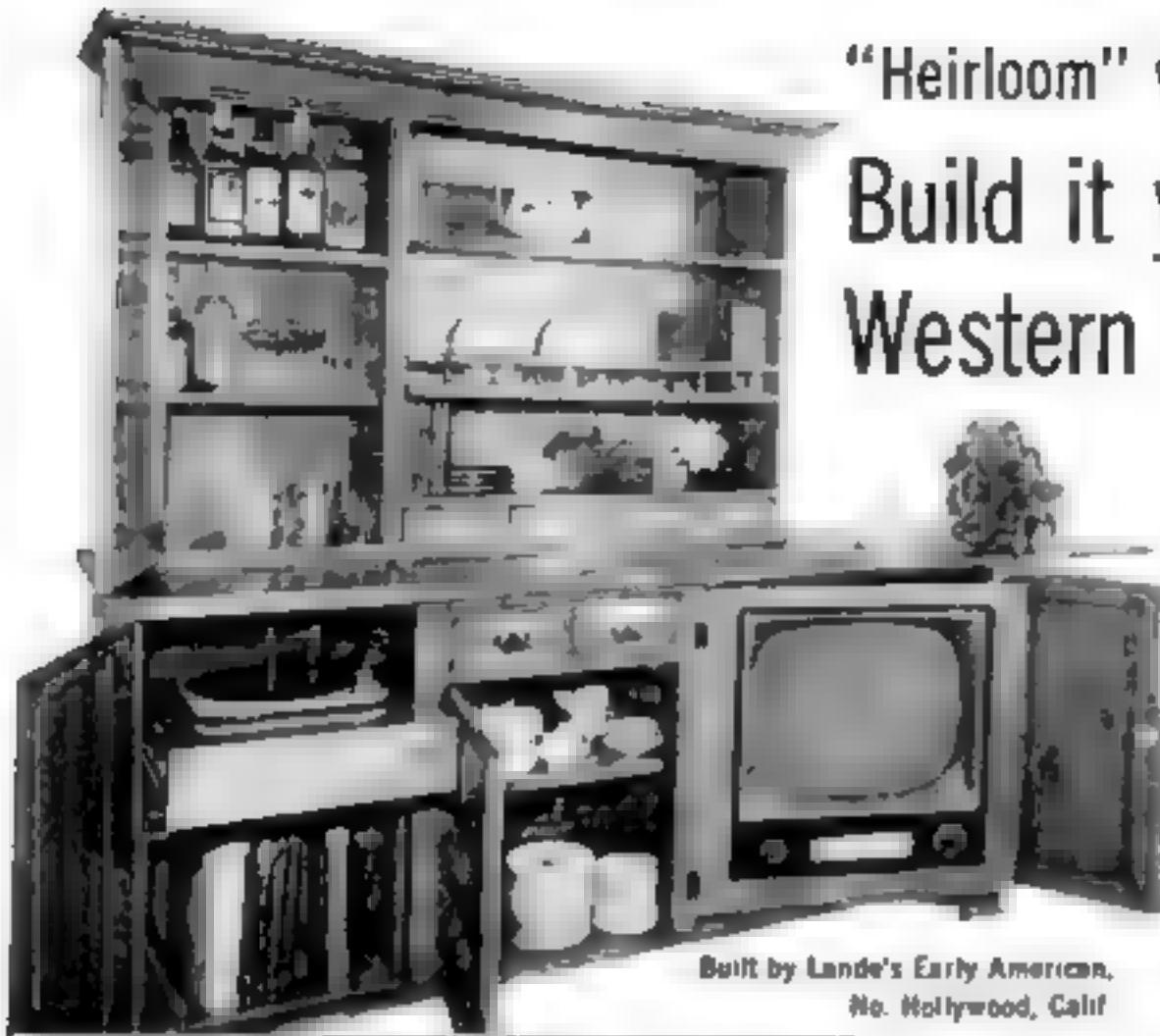
►►►WHEN sawing boards that have been used for concrete forms, the smart carpenter sets his portable-saw blade about $1/32''$ less than the thickness of the material and saws from the side that is clean. This way, there's no risk of dulling the blade by cutting into dried concrete. The remaining sliver of wood is easily broken away.—*Ned M. Perkins, Orange, Tex.*



Easily Changed Photo Gallery

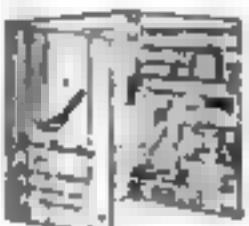
THE PLASTIC brackets that hold a wall mirror in place will also hold a display of your favorite photographs. Mount the

prints on salon display boards and screw four mirror brackets to the wall for each board. Changing photos is simple because the mounted photos slide in and out easily.—*Glenn S. Hensley, Columbia, Mo.*

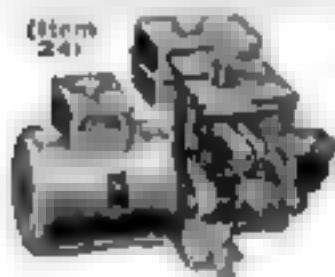


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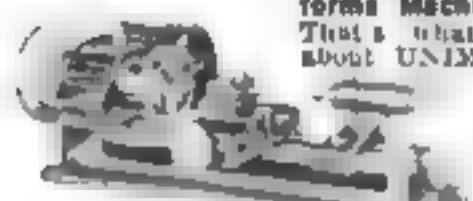
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A Safety Expert Looks at Turnpikes

[Continued from page 81]

the original budget for this purpose, and additional sums are constantly being spent. Many miles of medial guard rails have been covered with a flowering vine and honeysuckle. At Telegraph Hill, near Red Bank, some 5,000 lilies and irises have been planted; the famous Holly Mile near Milepost 17 displays over 100 native holly trees; through one congested area over 7,200 shrubs and vines have been set out.

I have heard hard-boiled highway engineers say that "the motorist doesn't give a hoot what the road looks like so long as it gets him there." This is wrong, and it is high time that planners of future roads learned it. Some roads can capitalize on natural scenic vistas for relief. But when you see Florida's Sunshine State Parkway traversing 108 dreary miles through subtropical country without the hint of a flowering tree or an exotic shrub except around the three restaurants, you see the prosaic highway engineer in his most dour mood.

Even highway signs can do something to provide diversion. The Massachusetts Turnpike has made a beginning by posting names of townships and counties.

6 High-beam glare not intercepted

Considering the inadequate width of most medial strips, headlight glare obviously bothers a large proportion of drivers, even on the six-lane stretches. The upshot is that after dark on busy pikes most drivers habitually maintain daytime speeds on low beam because they get tired of constantly kicking the dimmer switch. Low-beam lighting is bad medicine when you're going at 88 to 103 feet per second. The logical solution is to eliminate the headlight glare so a driver can use his high beam as he should for the posted speed.

For my money, the Garden State Parkway's clever deflector of headlight glare should be mandatory on all expressways. It is a kind of Venetian blind on its side, an open slat fence some four feet high, with the slats running at right angles to the rails. Proper spacing of the slats makes it impossible for any glare from oncoming lights to come through at an

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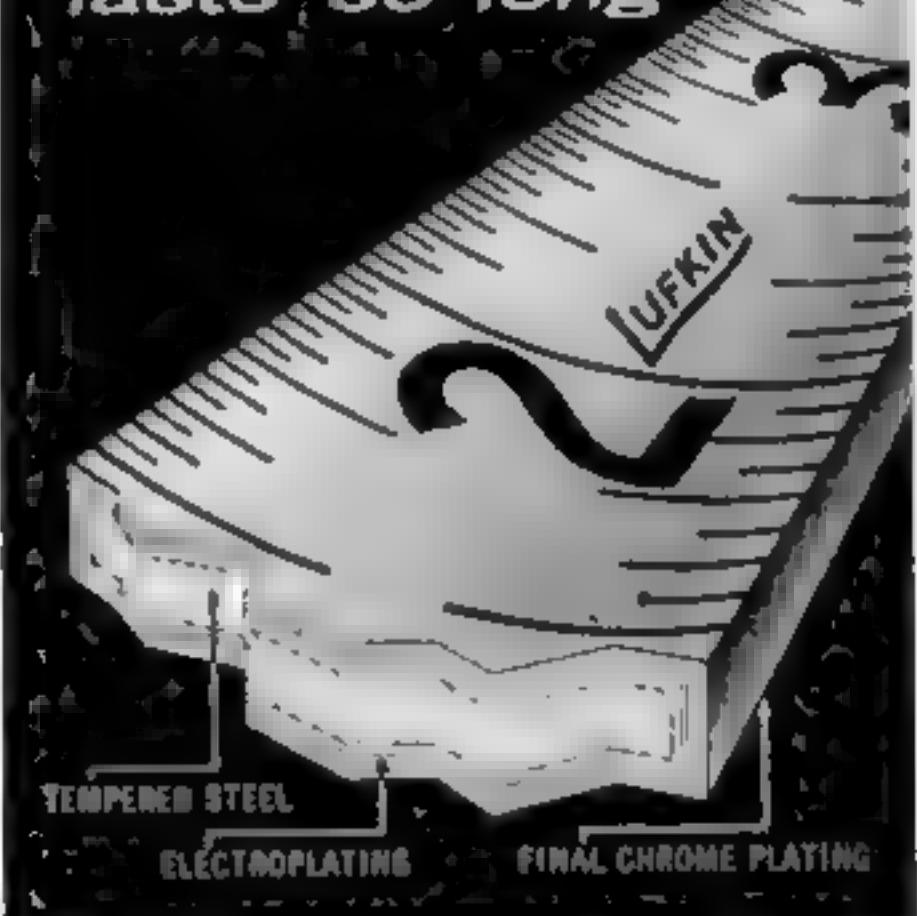
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A Safety Expert Looks at Turnpikes

oblique angle, yet you can see through the fence if you turn your head.

Apart from these six specific things, there are other turnpike lessons to be noted. It is reported that there may be no service stations or restaurants on the new interstate network. This would be a grievous blunder. Restaurants are far more than a convenience; they are a safety factor in providing relaxation and refresh-

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ment. As for service areas, they are an absolute necessity on a limited-access highway where a motorist may be stranded many miles from help.

Closely related is the need for a saturation of state-police patrols never before dreamed of on state highways. Not only do motorists have breakdowns at remote points—750 a month run out of gas on the short New Jersey Turnpike; 1,100 have flats; 1,800 have mechanical breakdowns—but they are fair game for criminals if policing is sparse. The 131-mile Jersey pike, with an average traffic flow of over 107,000 vehicles a day, has 92 troopers on patrol, or one for each nine miles of highway around the clock. (They have lately added six plainclothes detectives for criminal work, not traffic offenses.) Limited-access pikes are no longer just roads. They are "long, narrow cities" with all the human and physical problems of a municipality with a floating population of some 100 million people a year.

The basic lesson of the turnpikes has been that it is possible to engineer accidents down toward an irreducible minimum. In the process, we change the type and character of the accidents that still occur. And then we cut these in half again with new engineering geared to the new problems.

END

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World's Biggest Sub *[Continued from page 91]*

actor. If the reactor speeds up and gets hot, it can "run away." So we've built a high-speed emergency cooling system. It can be triggered instantly if Triton is hit."

A safety injection system, I was told, prevents the products of fission from getting into the habitable parts of the sub if the fuel starts to disintegrate.

Engines can be repaired while Triton is underway. The steam from the heat of each reactor can be sent to either turbine—another "first"—and the single reactor can shoot the sub along the surface or undersea at 75 percent of her normal top speed.

Meanwhile the damaged reactor can be shut down and crewmen can clamber in to repair it. Inside, as in all other parts of the submarine, plenty of elbow room has been left so the crew can work efficiently. Big eyes and trolley tracks to support hoists have been built into overhead beams where needed.

The ship's service generator, often inaccessible on subs, is easy to get to. Electronic equipment can be rolled away from the bulkhead on tracks so technicians can get in behind to repair it.

TRITON'S lines are not as sleek as the Albacore's. Her bow is more like a destroyer's, and for good reason. She is designed to make as much speed on the surface as she does underwater. That means that she's more stable than Albacore on the surface, for she can take the pounding of rough weather at high speed without rolling excessively, then quickly drop to her floor where she can continue at the same speed.

The sail is not sleek. It is big and round to house the many complex, hydraulically retractable radar antennas that will sweep the horizon in search of enemy aircraft and ships.

With her fantastic maneuverability, her tremendous range, and her high reliability, Triton may well be the forerunner of our underwater fleet of tomorrow. END

Next Month: How do lightning rods work? When doesn't a house need any? How do you check installation? Knowing the right answers could save you lives and dollars. Read: "Why Lightning Rods Are a Good Thing" . . . in August PS.

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Buyer's Guide to Window Fans

[Continued from page 138]

Most experts also agree that there is little value in the idea that one twin can pull air in while the other blows it out. To work properly, a fan must exhaust air from the entire room so it can be replaced by fresh air flowing in through other windows. Two fans working at cross-purposes in the same window simply transfer air from one fan to the other without circulating it through the room.

In general, it's best to use twins only where a single larger fan won't fit.

How to see through the glitter. You'll be intrigued with such advanced convenience features as automatic thermostats, three-speed switches, air purifiers, electrically reversible motors, dust and pollen filters, indicator lights, rollaway stands, diffuser grilles, and certainly the high-fashion styling.

But to be sure of getting efficient, trouble-free service the first things to look for are:

- Sturdy construction
- Ample motor power
- Good mechanical balance
- Quiet operation

Construction: Inspect the motor mount closely to see if it is sufficiently rigid to carry the fan motor without vibrating. A tinny metal frame will rattle when you get it home even if it won't in the store.

Motors: Most makers rate their motors on input watts—from 100 to 200 watts for a 20" fan—or in fractional horsepower, usually about 1/15 hp. While these are only rough guides to motor power, they may help in spotting any that are way out of line with the average.

Mechanical balance: Bad blade balance and alignment are frequent causes of fan noise. In manufacture, blades are precisely matched by weight in sets before being fused to the metal hub. Even then, the assembly must be checked and weights added where necessary for true balance. Test the fan before you buy to detect undue noise, vibration or rattle.

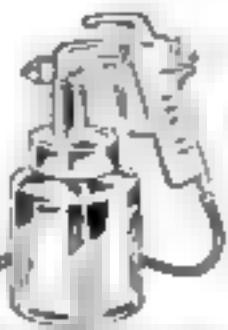
It is possible to step up the air-moving capacity of a fan by giving the blades greater pitch, but if the motor is not designed for that duty it will labor noisily and may even burn out prematurely. You can check this by letting the fan run and making a noise comparison. The right blade pitch is one that gives greatest ef-



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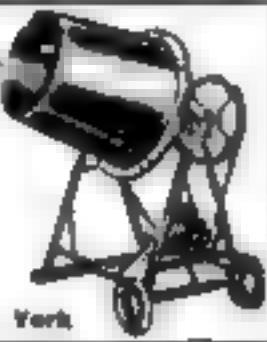
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Buyer's Guide to Window Fans

ficiency with the motor at the lowest noise level.

The "extras." After you've decided on a specific make, you'll face the question of special features. You can get a 20" standard-make fan, such as a GE, for \$29.95, \$34.95, \$44.95, \$59.95, or \$69.95. All have closely equivalent blades, motors and housing. The differences will be in the styling and convenience features.

A reversing switch makes it easy to change the rotation of the blades so they pull air in instead of blowing it out. This may be necessary in rooms with no second window to let in fresh air. In this case, it's best to exhaust some hot air first, then quickly reverse the fan to draw in cool outside air.

A reversing switch adds about \$10 to the price of a fan. Without one, most fans can be reversed by turning them around in the window, but this takes a little time.

A built-in thermostat adds about another \$10 and does have some drawbacks. It cannot be as closely controlled as a furnace thermostat and does not respond entirely to true inside temperature since it is affected by the air passing through it at the window. But it does help prevent overchilling at night by shutting off the fan before the temperature drops too low.

You may prefer a timer, at lower cost, which can be set to turn off the fan after you've gone to sleep.

Portability. There will be occasions for using a fan other than for exhaust. During the day, when the sun is strong, it's best to keep all windows closed and shaded, so hot outside air is sealed out. The fan may then be used to circulate and freshen the air.

For this reason, many fans have carrying handles or can be placed on wheeled stands to make them easily portable. Some fans, however, are strictly for use in windows and are not adaptable for other purposes, as the side window panels are part of the motor housing.

Speed-selector switches let you run your fan at two or three different speeds to vary the volume of air it delivers. This way, you can set it at the lowest speed that will provide the cooling capacity you need and keep noise to a minimum. In a bedroom at night, this may be well worth the few extra bucks that such a switch costs.

END

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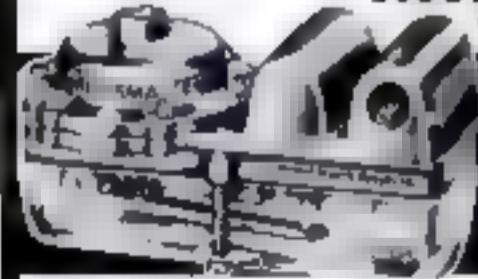
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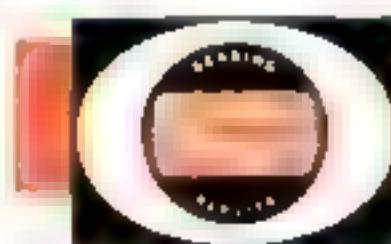
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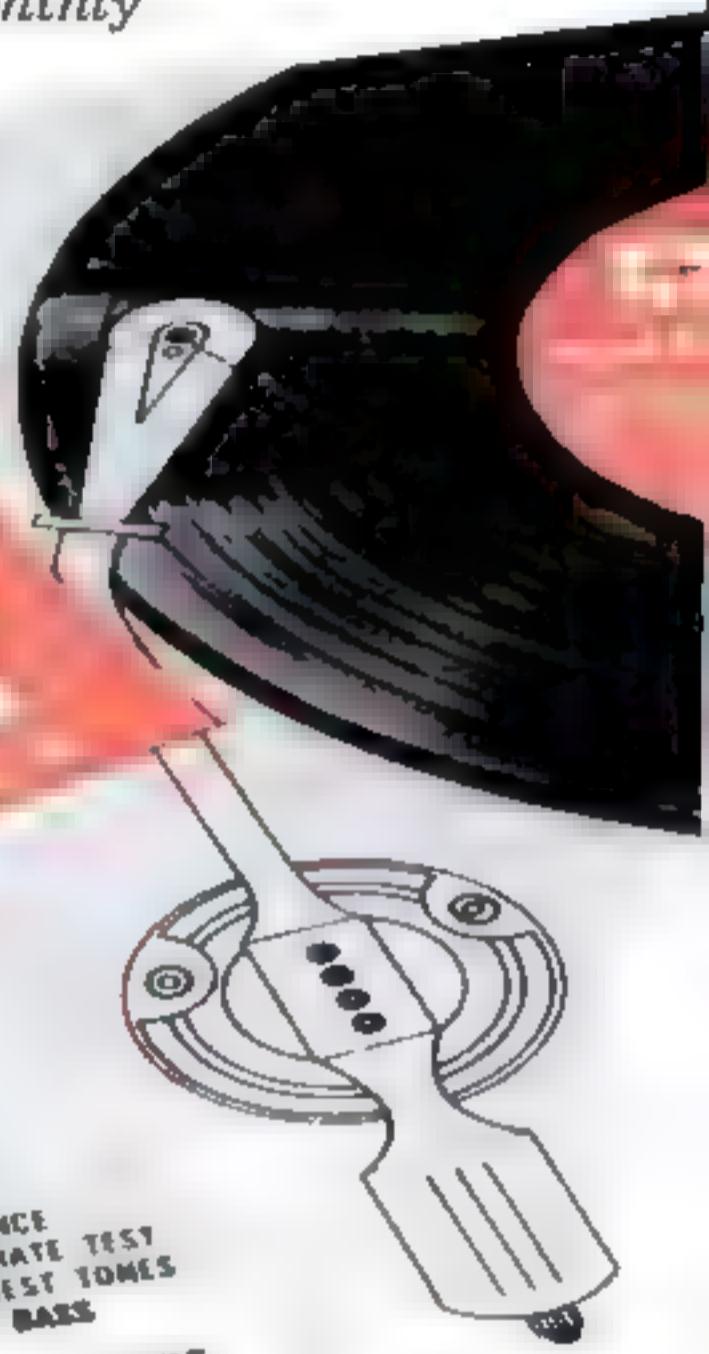
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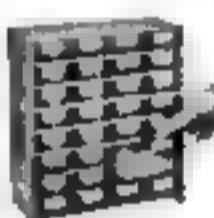
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How Dangerous Are the Small Cars?

(Continued from page 78)

cident reports, light cars against heavy cars, this time by groups. Group for group, the accidents were nearly identical: same impact speed, same type of crash, same body style. The planned difference was car weight. The unplanned difference was injuries. That is, there might turn out to be an injury difference, light car versus heavy, or there might not.

For instance, take accident configuration F, which stands for cars running into trucks. In the light-car group, there was one case, No. 151205, involving a sedan striking a truck at 40 to 50 m.p.h. With fog dimming visibility, a White semi-trailer pulled out of a side road into the path of a VW; the VW driver was slightly hurt.

In the heavy-car group, there were three comparable collisions, among them Case 122907. A '56 Chevy Bel Air went out of control on a curve and rammed the trailer of an International semi. The Chevy spun around and traveled backward 30 feet. Its driver was unhurt.

In all, 101 light-car accidents could be matched against 1,361 heavy-car accidents in 74 categories. The injuries in each accident were graded (on a scale that scores zero for no injury, one for a minor injury, and on up to six for a fatal injury). The scores were averaged for each accident group, added to give totals, then compared to see if there was a difference. There was:

• **Rollovers.** Injuries averaged several grades higher (more severe) in heavy cars than in light cars. The numerical difference is not conclusive—the results could have arisen through chance—but light cars look better here.

• **Collisions.** Injuries averaged several grades higher in light cars than in heavy cars. Again the difference is not conclusive, but heavy cars look better here.

• **All accidents (rollovers and collisions lumped together).** Injuries averaged slightly higher in light cars than in heavy cars. This result is close to conclusive, but doesn't quite make it. Again the heavy car looks better—slightly.

What it means. Small-car buffs, whose fierce loyalty to their adored bugs is legend, will stomp all over these findings with their imported rope-soled shoes. The statistically sophisticated will argue that

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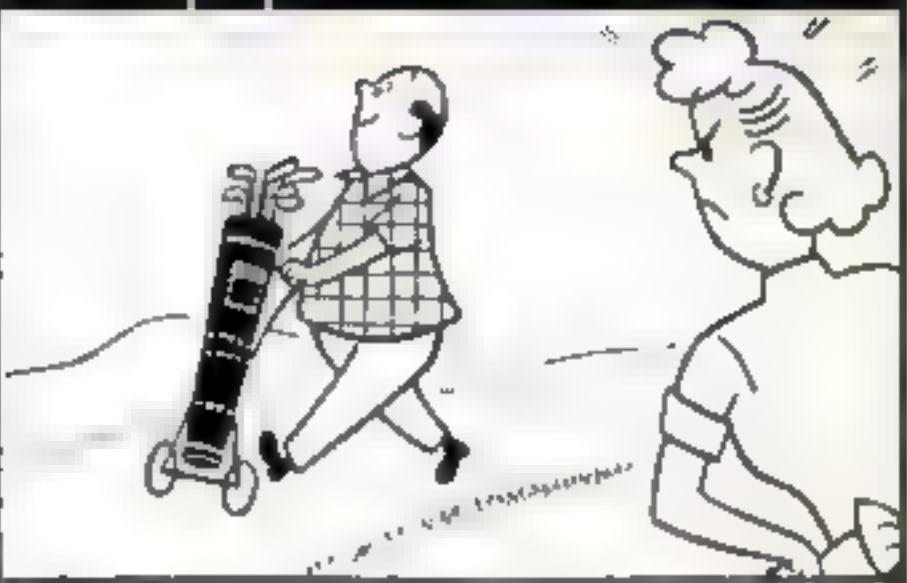
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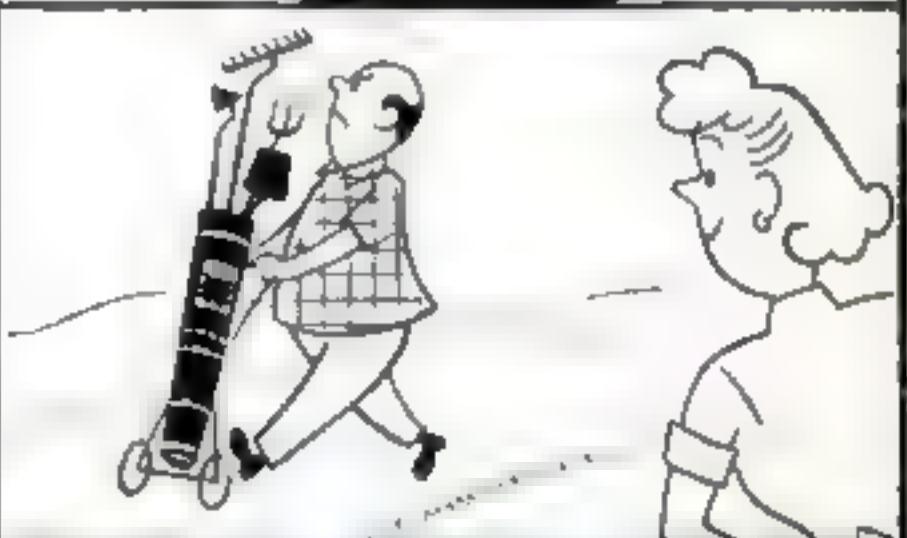
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How Dangerous Are the Small Cars?
the sample is too small, the results not significant.

Admitted. The Cornell researchers are quick to warn that they cannot now prove any safety differences between small and big cars. (To them, proof means 100-to-one odds against being wrong.) But they are confident that the trend they see is a reasonable one:

Heavy cars may be very slightly safer overall (because they offer greater protection against the most likely danger—collisions).

And the researchers remind you that:

- The best way to avoid getting hurt is to stay out of accidents.
- Any car—big or small—needs the standard safety package: belts, padding, positive locks.

The comment of a policeman, handwritten on Case 240014 (a three-times-rolled Austin whose driver was found dead 15 feet from the car), fits here. Wrote the cop: "Inside of car intact—seat tracks in place: If safety belt was used, fatality might have been prevented."

END

Cellar lockers freeze food

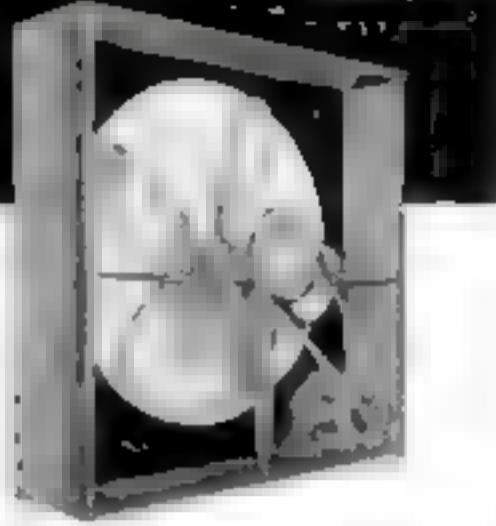


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New Ideas on Keeping Cool

[Continued from page 74]

protective responses are increased blood flow to the skin (which carries internal heat to the surface) and increased perspiration, which cools you by evaporation.

You normally burn about 300 calories an hour in the working day. But you can get rid of as much as 1,000 calories in an hour by sweating. So "sweating it out" isn't merely a figure of speech.

That four-day acclimatization, to summarize from a report by Dr. David E. Bass and Dr. Elsworth R. Buskirk, of the Quartermaster research center, goes like this:

On the first day of a heat wave, there is a dilation of the blood vessels in the skin. The blood transfers heat to the surface, where it is lost by sweating. Perspiration increases, along with the heart rate and the cardiac output—the amount of blood being pumped.

But the amount of blood available does not immediately increase. So when exercise calls for more blood in the muscles, there is a growing shortage in blood volume and a lack of blood in the viscera and brain. This may cause dizziness, a rapid pulse, and decreased heart output.

The demand for blood in the muscles diverts blood from the body surface and so the transfer of heat to the skin is impaired, with a rise in body temperature. Thus on the first day the heat load imposed by exercise may be too great, resulting in discomfort or collapse.

But as you become acclimatized, blood volume increases. Now, the response to muscular demands still leaves enough for cooling, and a lower body temperature results because there is better heat transfer to the skin. The pulse rate goes down. There is more sweating in the first week, with little change thereafter.

Ordering your body to adapt by graded exercise or work brings this adjustment into action. In five days you can be acclimatized, more comfortable and capable of more activity than you would have thought possible the first day.

That's especially important for athletes who have trained in cool climates, say Doctors Bass and Buskirk. Conditioning for performance in the heat can make all the difference between loss and victory. If two teams or individuals of the same skill and physical conditioning are to compete in hot weather, the acclimatized team

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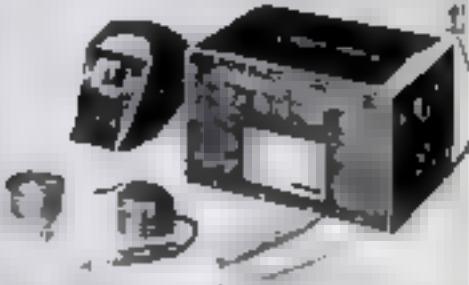
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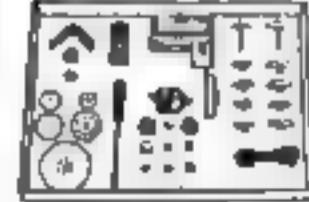
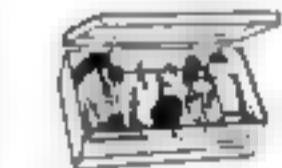
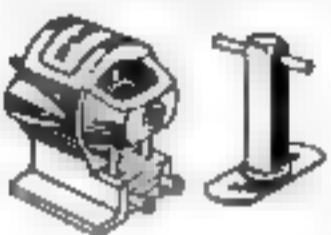
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In December, 1956, Massachusetts' outstanding school football team went to Florida to play the best school team in that state. Since it was a post-season game, the Massachusetts boys were not acclimatized. Played on a hot, humid day, the game was close fought until the third quarter. Then, as if unopposed, the Florida team romped on to victory.

"Our current thinking on how to beat the heat is to understand our natural cooling system, try not to interfere with it, and give it every chance to work at maximum efficiency," says Dr. Austin Henschel, another of the heat researchers. "Along with this, we are recognizing the importance of permeability and evaporation."

Experiments behind these findings were carried on in Arizona deserts, Panama jungles and Arctic ice fields, but almost any weather conditions can be duplicated in the Army's consolidated Research and Engineering Center at Natick, Mass. Here climatic chambers can produce temperatures as low as minus 70 and as high as 165 degrees, with any desired humidity.

Experimental hot-weather clothing is one of the end products of this research. A fantastic new suit borrows from the chemise and the old-fashioned hoop skirt by having stays that keep the cloth an inch and a half away from the body. The stays let the wearer's skin breathe through "chimney" passages in pants and jacket.

A tent that works on the same principle allows air to circulate along its walls and roof through built-in channels.

The Army's findings, vital to military personnel, have a highly personal meaning to civilians as well. Hot-weather adaptation can be a boon in these days of rapid air transport for anybody who must go on short notice from a cold to a hot climate. It can be equally important to those of us who want to keep active, efficient, and comfortable on hot summer days right around home.

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When They Discovered Men on the Moon

[Continued from page 64]

improbable stories. Many strongly believe in such unscientific phenomena—not necessarily hoaxes—as reincarnated Irish lassies, flying saucers from outer space and houses haunted by whimsical poltergeists.

Not too many years ago, people tuned in a radio play and whole families fled from Martians. So the gullibility that made people suckers for the Moon Hoax is still operating. And hoaxes are still being perpetrated with great ingenuity. As Shakespeare wrote, "O what a goodly outside falsehood hath!" Finally, unexpected things may occur that seem to sup-

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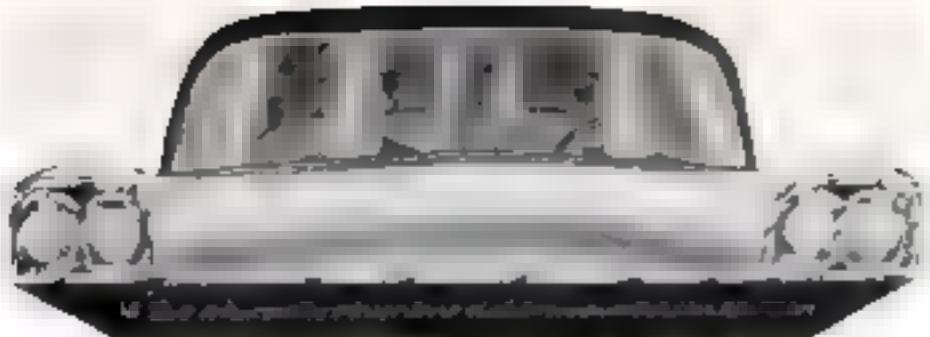
port a fraud, as when people give false testimony because of an honest error—or dishonestly to win publicity.

THE best defense, then, against being fooled is the same today as it was in 1835: to be a little skeptical and to have a good basic scientific knowledge. For example, millions of people around the world accepted the Communist propaganda about germ warfare in Korea. But to anyone with knowledge of how bacteriological warfare actually would be waged, it was technically absurd that the United States was bombing North Korea and China with clams infected with cholera and spiders carrying anthrax.

True, the shrinking of distances by air travel and instantaneous communications would today render such a hoax as the Sun's short-lived. Reporters would flock to South Africa; within 12 hours the fraud would be exposed. But not Dr. Marchenko's amazing (and entirely fictitious) tale. The universities as well as the launching pads of the Soviet Union are very much closed to us. A Red denial of the story would mean nothing either way.

In any case, it will never hurt to apply scientific skepticism—and to keep in mind the astonishing story of how intelligent people were fooled by the biped beaver and the Vespertilio-homo.

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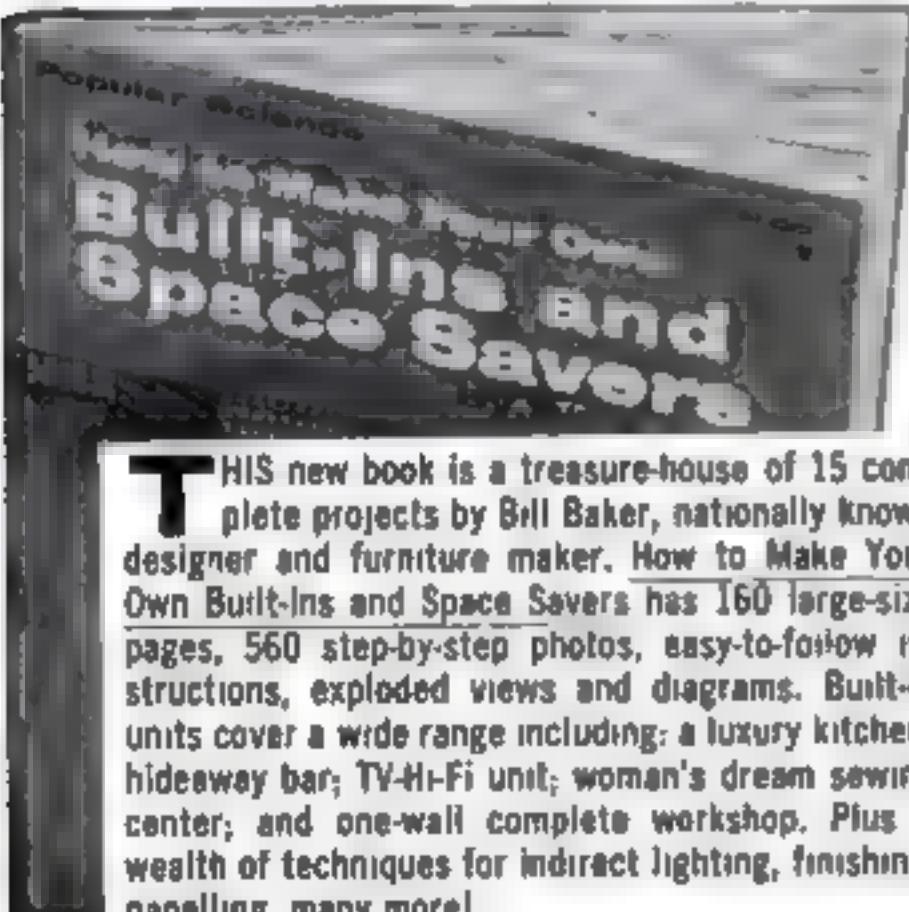
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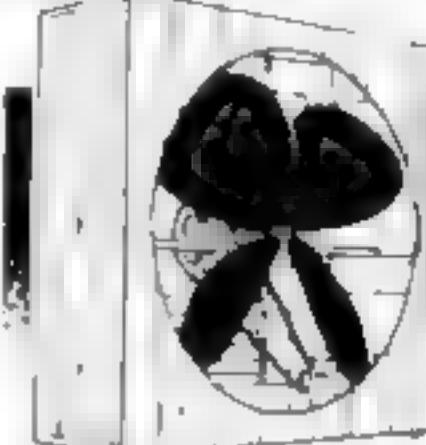
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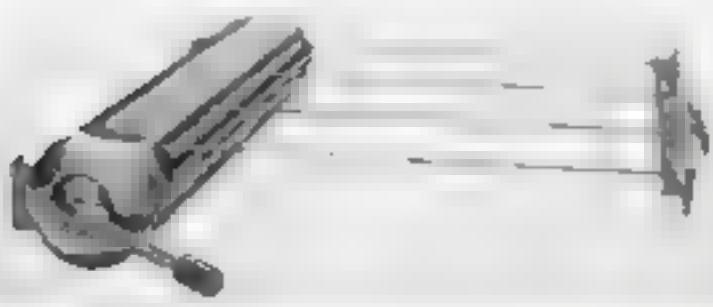
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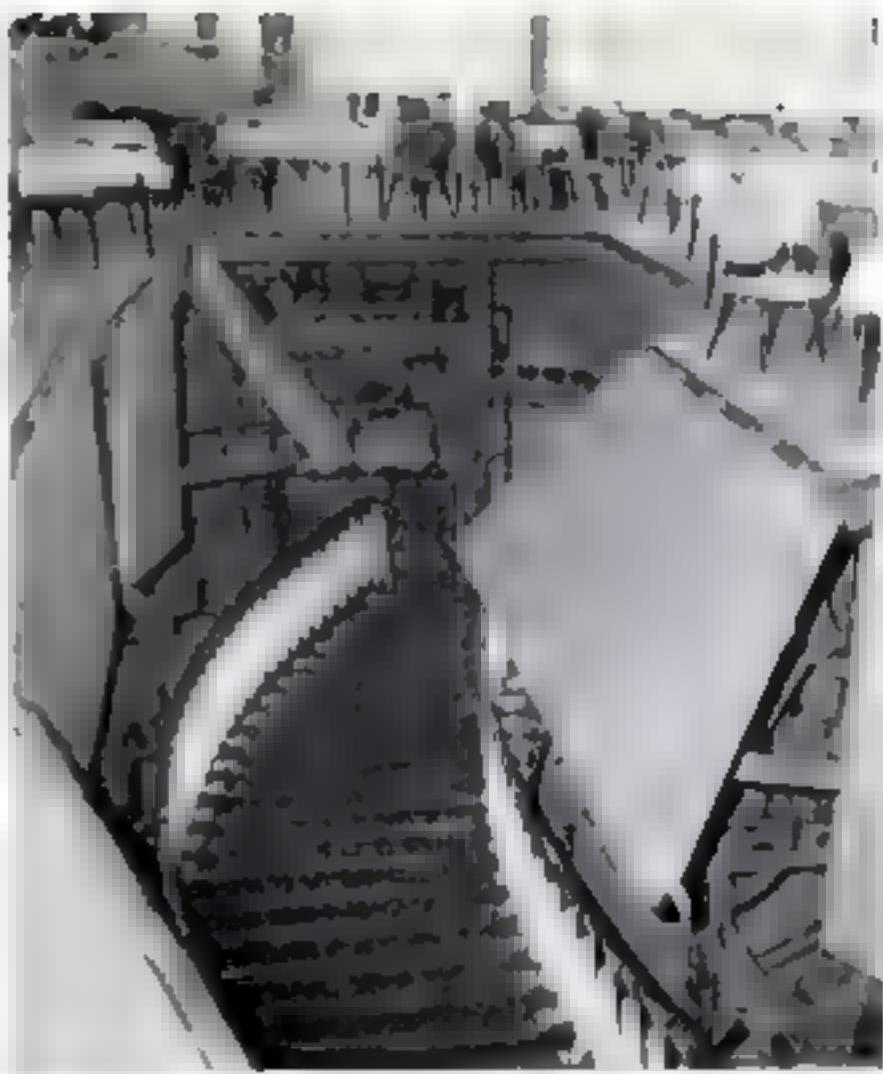


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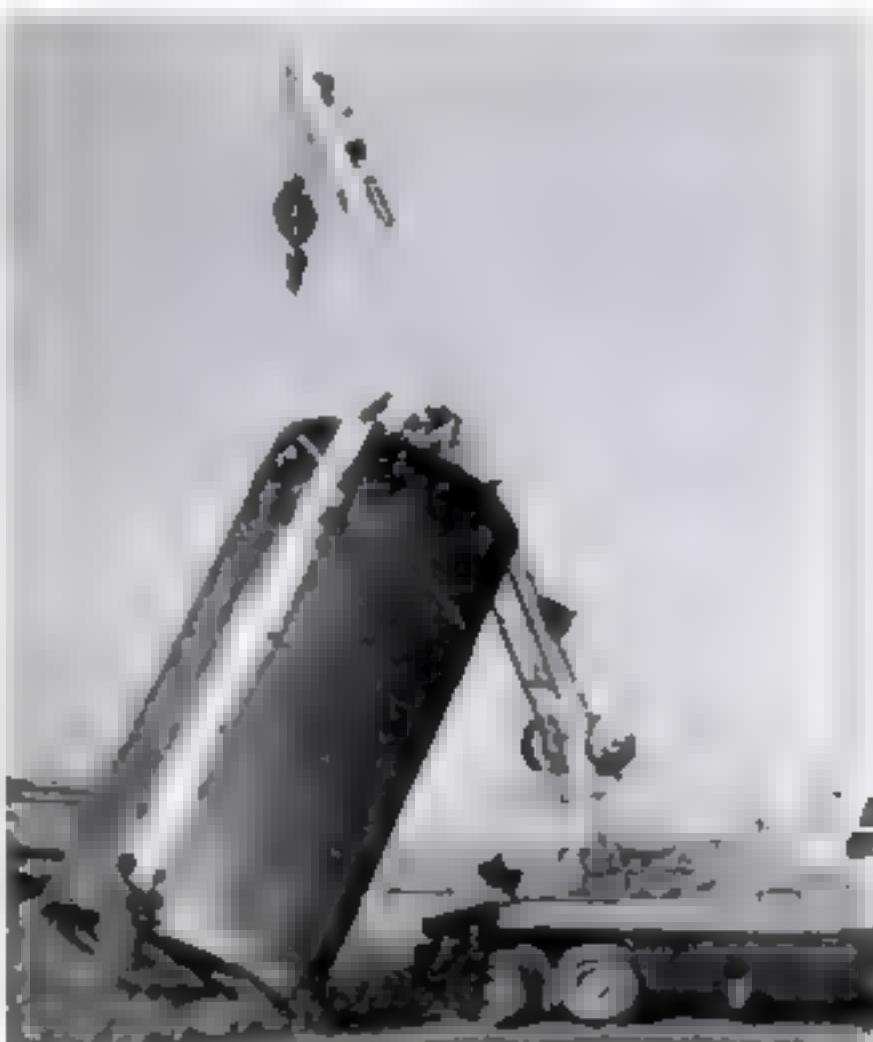
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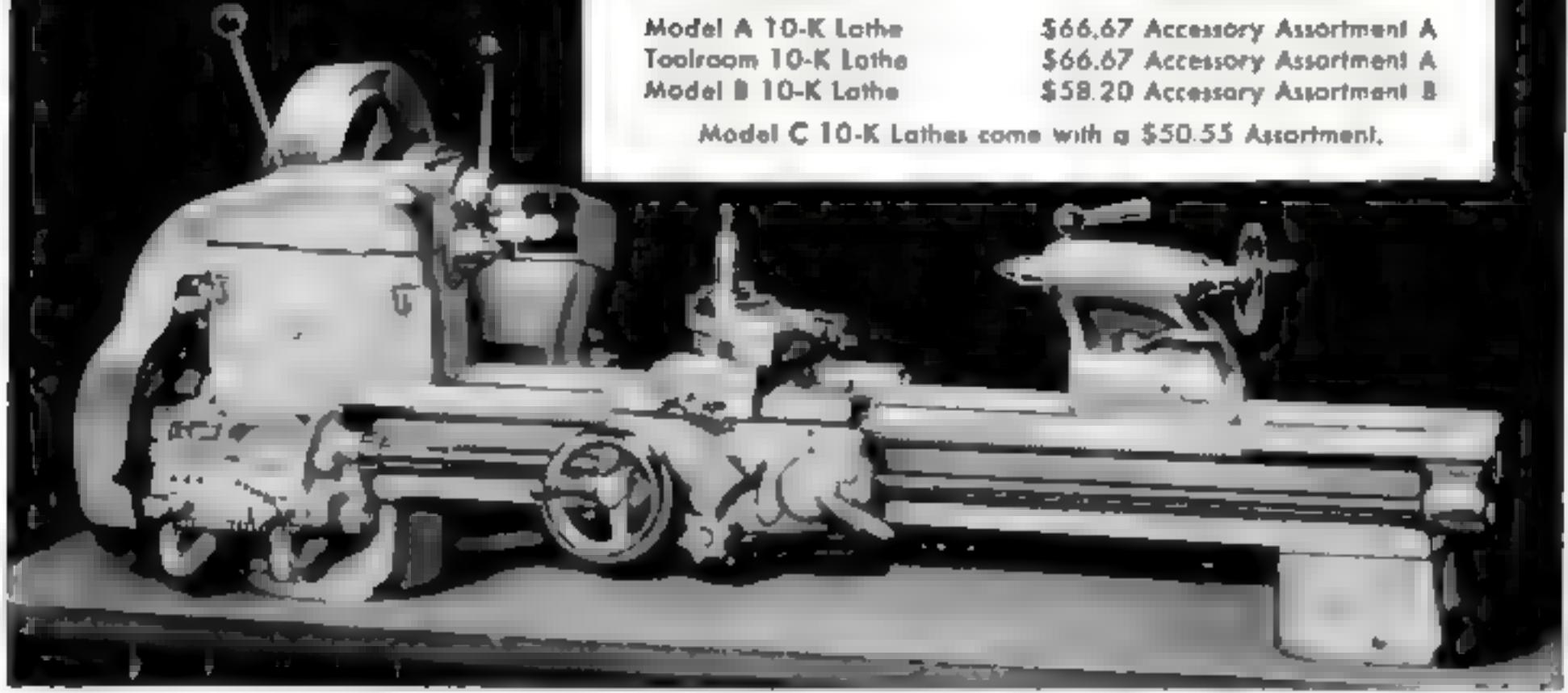
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CL670Z	A	3 $\frac{1}{2}$ '	570
CL670A	A	4'	594
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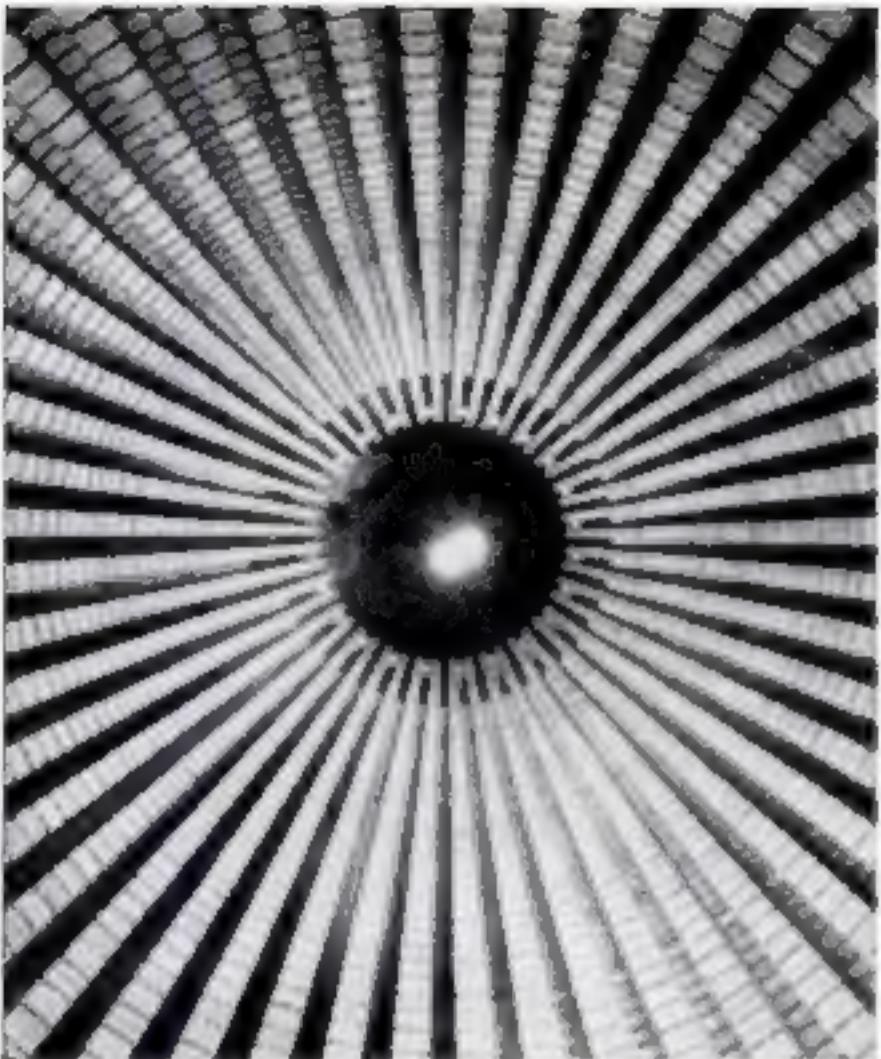
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Big stator goes into generator

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Sky phone talks to ground

You soon may be able to call home from the air. This radio telephone being used by an airline stewardess has been installed in a Northwest Orient Stratocruiser for testing and to check public reaction.



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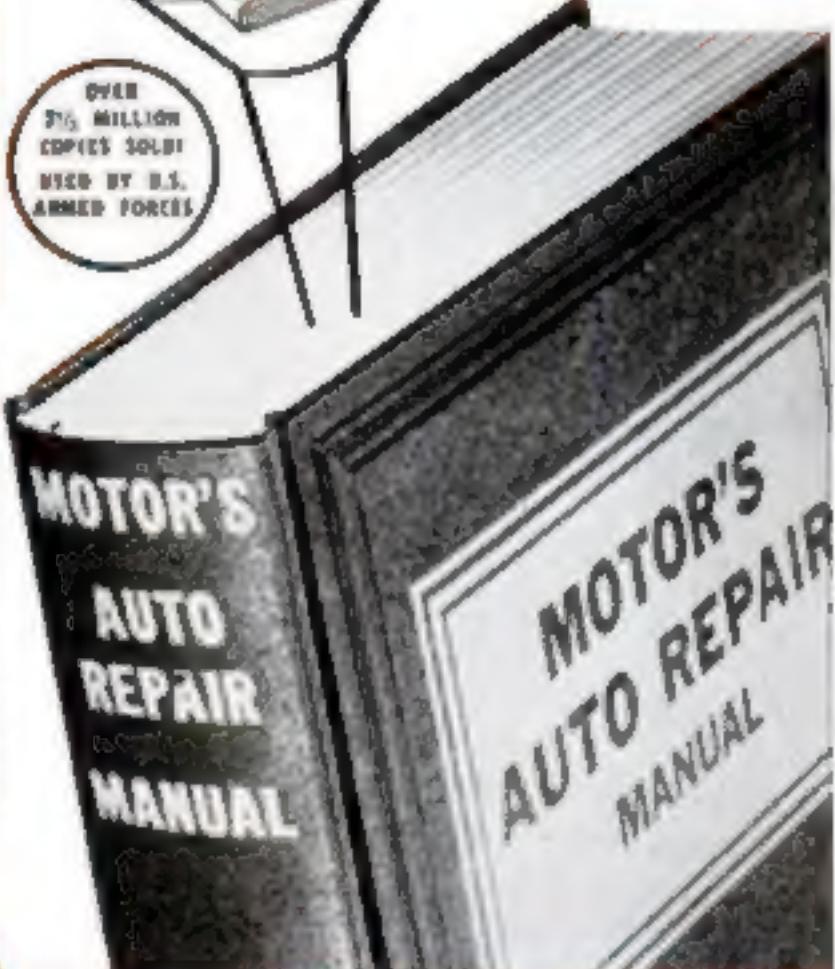
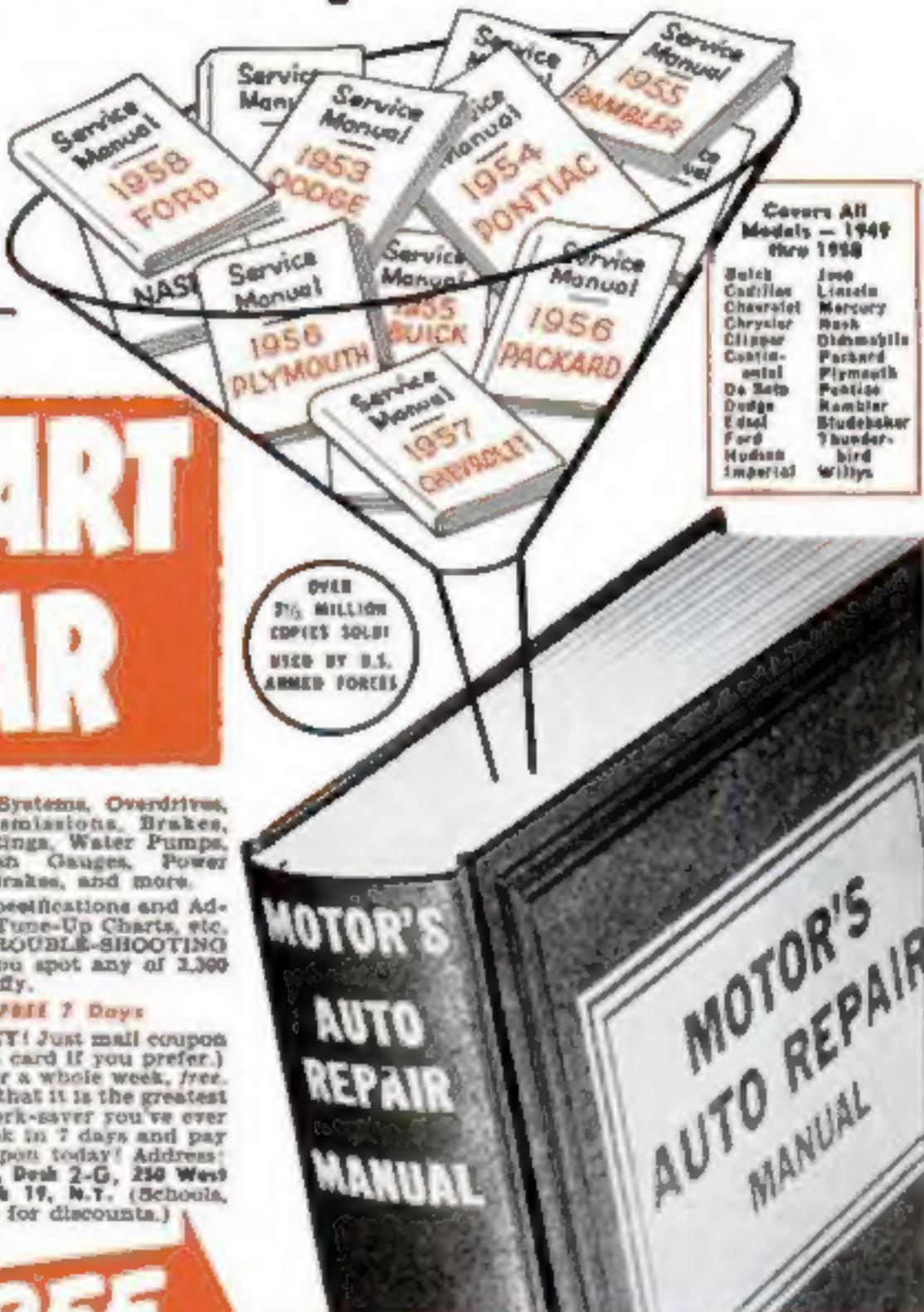
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